Concrete

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Structural Haydite Concrete *in* Flat Slab Industrial Building

Four-Story Upward Extension of Building for Chicago Screw Company Described — Material Investigated in Advance—Unique Mixing Method Employed—Concrete of Unusually Good Quality and Appearance

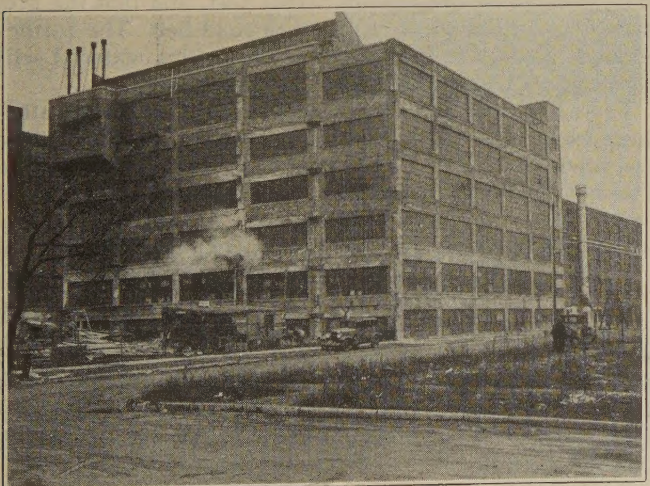
By JOHN BAPTISTE FISCHER
Architect and Structural Engineer, Chicago, Ill.

THE use of haydite as the coarse aggregate for the structural concrete in a building intended for moderately heavy industrial use is well represented in the extension to the Chicago Screw Company's manufacturing plant at the corner of South Homan Avenue and Fillmore Street, in Chicago, built in 1929. The building is of flat-slab construction, reinforced in two directions.

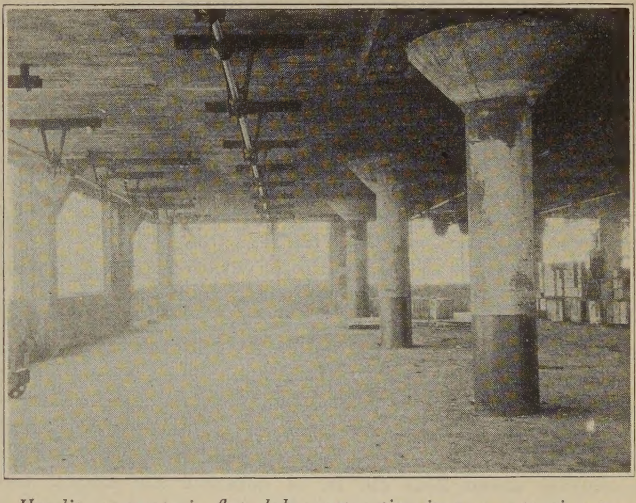
The work constructed during 1929 consisted of a four-story upward extension of an existing building having a high basement and one story. The older part of the structure had been designed for a live load of 250 lbs. per sq. ft., with the further expectation, of course, that the concrete would be ordinary stone or gravel concrete weighing about 150 lbs. per cu. ft.

Changes Made Higher Structure Possible

By reducing the design live load of the addition from 250 to 150 lbs. per sq. ft., and by using haydite as the coarse aggregate for the concrete, we were able to add four stories instead of two. Consequently this building, as now completed, consists of six stories, counting the high basement as a story.



Use of light-weight aggregate and reduction in floor load made addition of 4 stories possible instead of 2 stories in the Chicago Screw Co. building, at Chicago



Haydite concrete in flat slab construction in new extension to Chicago Screw Co. building

The building extends for five bays in each direction, except that space was left for an inner court with a width of two bays and a length of three bays.

The floor panels measure 23 ft. 9 in. by 25 ft. The floor slab outside the drop panel is 9 in. thick, plus 1 in. of finish. All structural parts, including the floor slabs, the columns and the spandrels, are of the same mixture of concrete, with ordinary torpedo sand as the fine aggregate and haydite as the coarse aggregate. We used the largest commercial size of haydite, but added about 10 per cent of a special coarse material up to the 1-in. screen size.

Inasmuch as this was our first experience with the use of haydite in structural concrete we were perhaps over-conservative in its use. This is true especially of the working stresses, which were based on an assumed crushing strength of 2,000 lbs. per sq. in. As a matter of fact, the test cylinders showed an average crushing strength of about 3,200 lbs. per sq. in. at the age of 7 days, with the lowest specimen testing 3,020 lbs. per sq. in. Since the 28-day strength could be expected to be considerably higher it is evident that our working stresses were exceedingly conservative and might have been based on a considerably higher crushing strength.

It seemed desirable to learn as much as possible about the performance of this material before actually starting the placing of concrete on the new building. The question that first entered the writer's mind was that of the amount of water that haydite might be expected to absorb. To obtain this important information we placed samples of haydite aggregate into a pan, heated it and dried it out thoroughly, after which successive samples of the dried material were weighed, then immersed in water for a stated period of time, removed from the water and allowed to drip off, then weighed again. These periods of immersion were for ½ minute, for 1 minute, for 1½ minutes, for 2 minutes, and thereafter at minute intervals up to 5 minutes and then at 5-minute intervals up to 30 minutes.

From these experiments the amount of water to compensate for that which would be absorbed during the 1½-minute mixing period was definitely fixed, and in this case it was 6.8 per cent of the weight of the aggregate. The absorption at 1½ minutes was about 95 per cent of that at 30 minutes, so that it was quite definitely established that this subsequent mixing of 2 minutes would not rob the mixture of water through further absorption by the haydite. In this way we were sure of the amount of water used per sack of cement. Wetting haydite in the pile leads to non-uniformity of the concrete. One batch may have 5 gallons per sack of cement and the next one 10 gallons.

With the foregoing facts in view, we decided upon a method of mixing which might be considered a unique method; but the excellent results obtained and the high quality of concrete produced seemed to justify the mixing methods employed. The purpose of this method, as will be seen, was that of giving the haydite aggregate its full 1½ minutes absorption before the cement was added.

The mixing was executed in two parts, in a 5-sack batch mixer. First we mixed all of the haydite, half of the sand and half of the water for 1½ minutes. Then we added the cement, the other half of the sand and the other half of the water, and 10 lbs. of "Colloy" admixture, and continued the mixing for two minutes more. With batches averaging about 21.4 cu. ft. of concrete the output was about 10 cu. yds. per hour. Where a greater output is desired, it would be well to use an additional mixer rather than to reduce the time of mixing.

The mixing proportions consisted of 1 sack of cement to 2.1 cu. ft. of sand and 3 cu. ft. of haydite, with 6.4 gallons of water to the sack of cement. As previously indicated, 2 lbs. of "Colloy" admixture were used to each sack of cement. The slump was about 8½ in.

The results of these mixing methods were far beyond our expectations. The concrete was without question the most uniform in appearance and quality that the writer has ever seen on structural concrete work. From start to finish the concrete as it came from the distributing buggies held to a uniform condition. All through the work we maintained the same proportions of cement, aggregate and water, except for a very slight variation in sand, made necessary at times on account of moisture in the sand. The water was controlled by a lock device and the quantity was not changed throughout the entire work.

The use of the admixture assisted greatly in reducing the harshness of the mixture. There was no segregation whatever. The material ran evenly out of the buggies and into place, and flowed around the steel reinforcement with only a moderate amount of puddling. In fact, the material was worked into place with less labor than is usually experienced with ordinary stone or gravel concrete of the same consistency.

When the forms were stripped we found the concrete dense and uniform in appearance, so that no plastering and very little patch work was necessary.

The weight of the concrete as actually placed in the work was about 115 lbs. per cu. ft. It will thus be seen that, compared with concrete weighing 150 lbs. per cu. ft., and considering the weight of the 9-in. floor slab, the drop panels and the column and column capitals, the average reduction in dead weight amounted to about 30 lbs. per sq. ft. of floor area. This reduction in dead weight permitted an appreciable reduction in the quantity of steel reinforcement required. From these same figures it will be seen that each column load was reduced by about 18,000 lbs. in each story, or about 72,000 lbs. per column in the four stories.

After each floor was concreted it was covered with damp sand and kept moist for 7 days. During this same period the columns and spandrel walls were sprinkled twice daily.

As previously suggested, we were perhaps over-cautious during this work, which was our first experience in the use of this material on structural concrete work. Possibly on future work the methods can be modified, although the results obtained show that the investigations and mixing methods employed gave us the information and the results desired. The haydite used was manufactured by the Western Brick Co., at Danville, Ill.

Propose Burned Clay Slabs for Roads and Floors

Much newspaper publicity has been given to a process said to have been developed by Professor J. B. Shaw, head of the ceramics department of Pennsylvania State College, and his son Myril C. Shaw, for the burning of large clay slabs for use in highway construction, floor panels and similar purposes.

The claim is made that these slabs can be burned to sizes as large as five feet by twenty feet, and that the precast slabs can be set on a prepared road bed. The further claim is made that the cost of roads of this material will be no greater than the cost of macadam roads.

Professor Shaw's process, which is still in the development stage, was discussed in a paper read by him before the annual meeting of the American Ceramics Society in Toronto, in February.

Pennsylvania Doubles Mileage of "Excellent" Pavement

Pennsylvania highways constructed in 1929 and rated as excellent in quality of surface showed a gain of 111 per cent over 1928. Out of 532 miles tested, 276 were shown to be "excellent," i. e., not more than 25 accumulated inches of roughness were recorded on the roughometer per mile.

In 1928 the meter covered 334 miles of new pavement and indexed 131 miles, or 39 per cent of the total, as excellent, while in 1929 "excellent" miles equalled 78 per cent of the metered.

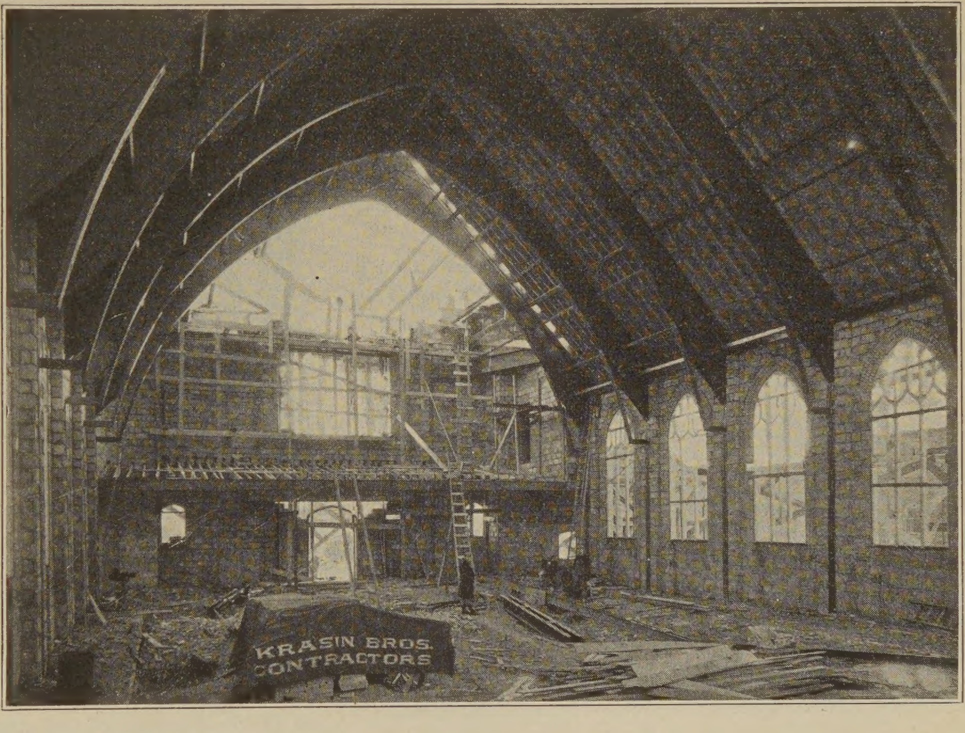
Selling 40,000 Concrete Units by Personal Sales Efforts

How Julius Sorenson & Sons Created Confidence in Haydite Units — Interviews With Architect, Owners and Prospective Bidders — Why Price-Cutting Competition Failed—Rendering Service After Sale Is Made

By JULIUS SORENSON
Julius Sorenson & Sons, Racine, Wis.

ALTHOUGH the job I am about to describe is not our largest in the number of block or in dollars and cents, it was one of the most difficult sales we have made.

Immediately upon learning that St. Anthony's Church congregation of Kenosha, Wisconsin, was planning the construction of a new church, we established contact with the architect, Charles O. Augustine, of Kenosha. He was familiar in a general way with our product—haydite concrete block and tile—but was a long way from being sold on the units, never having specified them before.



St. Anthony's Church, Kenosha, Wis., utilized 40,000 haydite concrete building units for back-up and in partitions

Winning the Architect's Confidence

Our first call was made for several purposes, primarily to get acquainted, to ascertain the attitude of the architect toward concrete masonry units in general, and to create interest in our product in particular.

We followed this initial contact with periodical calls each week thereafter. Instead of trying to cover all the features and qualities of our product in one or two calls, we made it a rule to sell him by steps. For example, the first three points covered were—

1—Our capacity and ability to handle the project;

2—The origin of the raw material used and the care exercised in manufacturing the units;

3—Quality and compressive strength. Copies of the official 1929 state tests of our block were introduced and furnished the most substantial evidence and conclusive proof of quality of haydite building units made at our plant.

On subsequent calls we covered and stressed the features of economy, fireproofness, sound absorption, insulation, nailing qualities and permanence.

Meeting the Building Committee

The fact that progress was being made was evident in each interview. The architect's growing interest became very pronounced. In fact he became enthusiastic, so much so that he suggested we meet the building committee. Ac-

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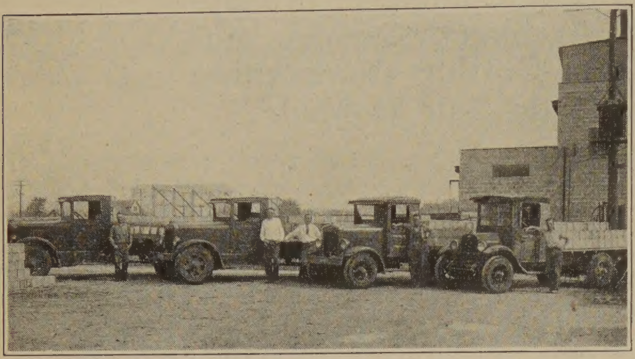
Paper presented before Wisconsin Concrete Products Association, at Eighth Annual Meeting.

cordingly, this was arranged. The architect was present at the meeting, introduced us and our product to the committee and requested that its features be explained. This was done, even to the extent of demonstrating the driving of nails into the block.

A conference was held, and the following day the architect advised us that our material was to be specified throughout for back-up and partitions.



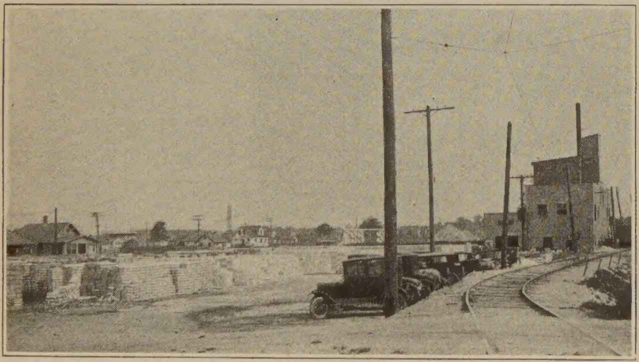
Haydite block plant and delivery equipment of Julius Sorenson and Sons, Racine, Wis.

Not content to feel that we had the job for a certainty, we continued our calls on the architect, always trying to explain some new point or feature of the product, and making helpful suggestions both during the drawing of plans and the writing of specifications.

The plans finally went out for bids. Our units were specified as the base bid, with clay tile and brick as alternates.

Interviews with Each Prospective Bidder

We obtained a list of the bidders and interviewed each one, either personally or by letter and telephone, and proceeded to place into their hands all available data regarding our product. The point we stressed more than any other was the economies they could effect through greater speed in laying, uniformity in size and quality, and the service which our organization was prepared to render. The effect of these interviews was evident in their bids.



Plants and stock piles of Julius Sorenson and Sons, Racine, Wis.

Why Price-Cutting Competition Failed

The contract was awarded to Krasin Brothers, builders, Marshfield, Wisconsin, after which we made contact with this company. We thought we were well on our way toward closing the sale; but the representatives of clay tile units got busy, offered a price that was $650 under our figures, went to the architect, the building committee and the contractor, and made every effort to land the contract.

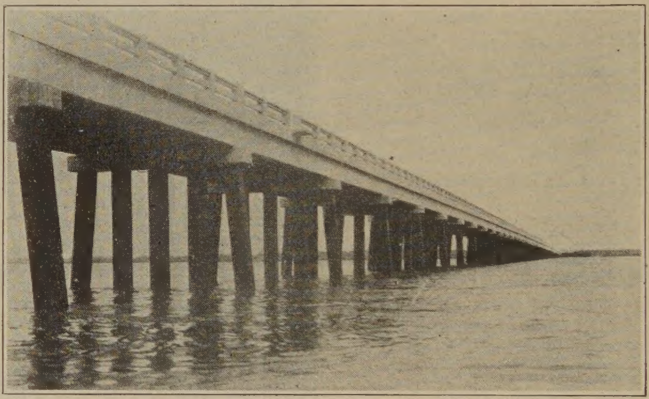
Herein lies the moral and key to the whole situation. We had "sold" the architect and building committee so thoroughly on our product that neither would permit this last-minute change. Both stood firm in their determination to abide by their better judgment, and as a reward for their pains our rivals earned the ill will of the architect for trying to upset matters at the last minute.

Servicing the Construction Job

Our work was not finished when the sale was closed. During the construction of the building we serviced the job almost every day, checked the stock on hand, and made it a point always to have sufficient quantities of each size of unit on hand. This earned the good will of the architect, the contractor and the owners; and today we believe we have another staunch supporter and enthusiastic user of our material. The building required approximately 40,000 units.

Huge Concrete Piles in Rigolets Bridge

A series of reinforced concrete pile bents supporting the concrete girder superstructure on spans of 40 ft. comprises 2,200 linear feet of the Rigolets Bridge on Chef Menteur Road across the outlet of Lake Ponchartrain, near New Orleans. The general contract for this highway bridge is held by the Nashville Bridge Company, Nashville, Tenn., but the concrete structure as well as the concrete piers and abutments for the steel spans, was built by the Frederick Snare Corp., of New York. The Nashville Company is now erecting the steel truss spans and the center-pier swing bridge.



The 275 concrete piles required for this trestle were cast near the bridge site. The piles are 24 in. square, and of lengths up to 90 ft. Pile reinforcement was placed 3 in. from the surface. The piles were jettied into position and the reinforced concrete caps on the trestle bents were cast in place. The bents are in perfect alignment throughout the full length of the structure.

E. L. Erickson is resident engineer on this work, representing the Louisiana State Highway Department.

Iowa Manufacturers Tell How They Made Best Sales in 1929

The Iowa Concrete Products Association held its eleventh annual meeting at Des Moines on February 19th and 20th. "The Best Sale Made Last Year and How It Was Made" formed the subject for a group of ten-minute talks by a number of Iowa manufacturers who explained how the best orders in 1929 were obtained by their individual organizations.

Geo. B. Smith talked on the coloring of concrete products, and on the following day, Gene Olson spoke about products machinery.

How to Save in
Concrete Form Work

Third of a Series of Articles on Details of Economical Concrete Forms—Wall Columns and Corner Columns—Providing for Girders and Haunches—Detail of Special Supporting Device

III—Forms for Wall and Corner Columns

By **A. B. MacMILLAN**
Chief Engineer, The Aberthaw Co., Boston, Mass.

THE second article of this series, published in the February issue of CONCRETE, was confined to details of form work for interior columns. Many of those details are applicable to forms for wall or corner columns and pilasters. This is true with particular reference to the size and thickness of form lumber, the details of column yokes, the spacing between yokes, and the method of using forms over again for columns of smaller size. In consequence, the February article should be consulted in conjunction with this one, in any problems involving column forms.

Length of Column Forms

In the previous article of this series, in the February issue of CONCRETE, the statement is made that the length of a column form for an interior column is the same on all sides of the column, the total length of the form being the story height, less the thickness of the concrete floor

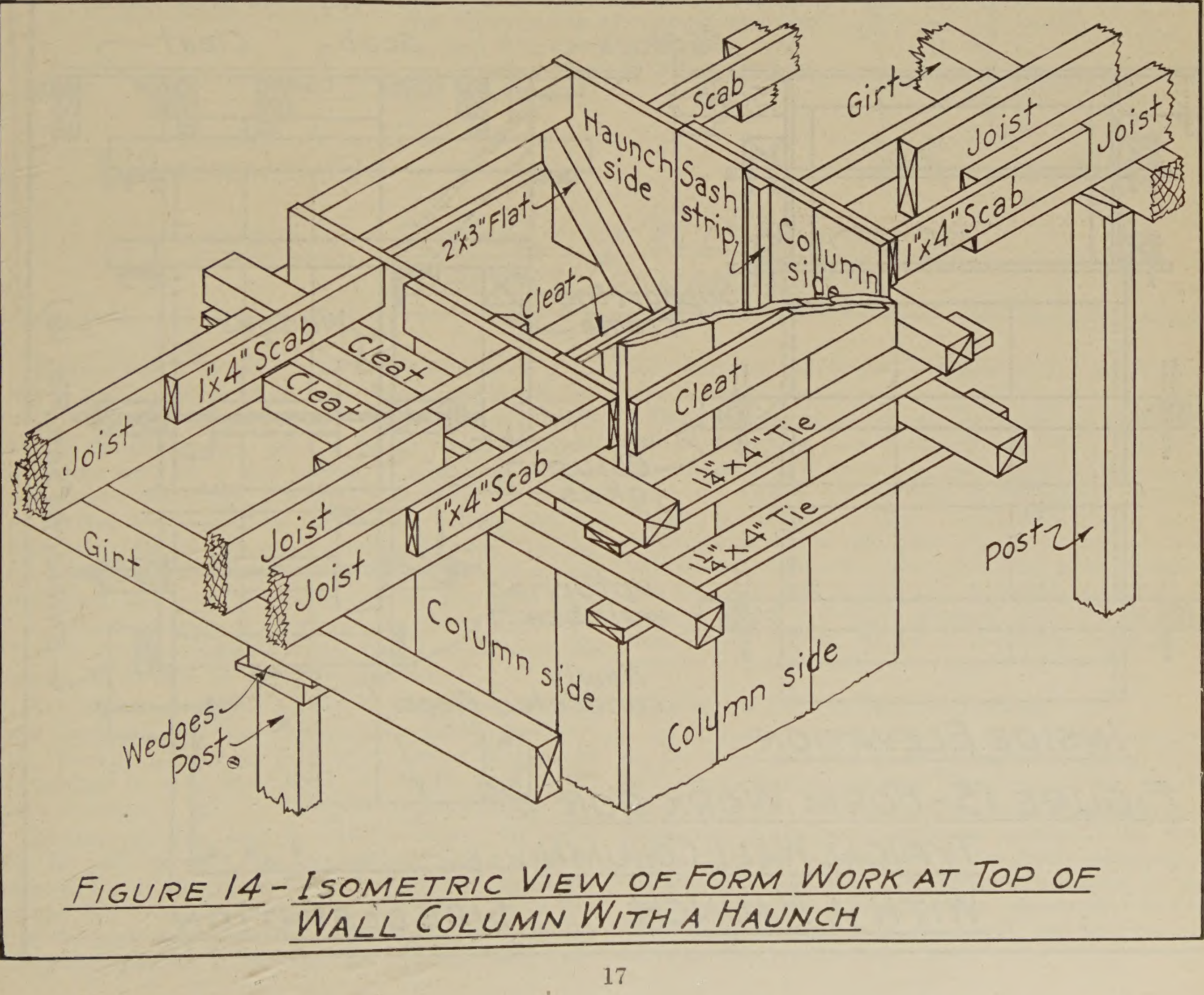


FIGURE 14 - ISOMETRIC VIEW OF FORM WORK AT TOP OF WALL COLUMN WITH A HAUNCH

slab and the thickness of the floor slab forms at the column forms. In the case where beams frame into such columns, the top of the form must be notched out, as shown in Figure 18 of this article.

With wall columns the form panels on the sides of the column are not all of the same length. The panel on the inside face of a wall column is usually of the same length as the form for an interior column in the same story. The end form panels of a wall column (on the two sides perpendicular to the wall) are longer, equal to a full story height, and they extend from floor level to floor level. They are, of course, notched out if necessary to receive wall beams. The form panel on the outside face of a wall column is longest of all, for it extends from its "Ell" block supports (See Figure 16) to the top of the concrete floor slab in the floor above. Consequently it is considerably longer than a full story height.

Some variation from these rules will suggest themselves. For instance, consider a column in which the beams or girders framing into it from four directions are of the same width as the column. In this case the top of the column form will be at the bottom of the girder form work. If the girders are not all of the same depth, the form panels for the column sides must in each case extend to the underside of the girder form work on that side. If the girders on two sides are not as wide as the column, the form work for those two sides must extend up to the forms for the floor panel and must be notched out for the girders.

Placing the Concrete

In all cases the column can be concreted only up to the level of the lowest notch. After the freshly placed concrete has been allowed the required time for initial set and shrinkage, the remainder of the column is concreted along with the floor.

Wall Columns Independent of Panel Walls

Wall columns are built rectangular, practically without exception. For architectural reasons the width of a wall column (the dimension parallel to the wall) ordinarily is the same in all stories of a building. Consequently on many buildings the form panels intended for the inside and the outside faces of the column may be used over a number of times, without being changed, except in cases where story heights vary.

Since changes in sizes of wall columns will ordinarily occur only in the thickness of the column (the dimension perpendicular to the wall), the forms for the two sides perpendicular to the wall should be made up so as to permit the necessary reduction in width where the column dimension is changed. This requires the use of strips of form board whose width is equal to the reduction in the column dimension, similar to the method shown in Figures 10 and 11 of the February article of this series. The same result may be obtained by replacing one of the form boards with another board of less width, the difference in width of the two boards being, of course, equal to the reduction in the column dimension.

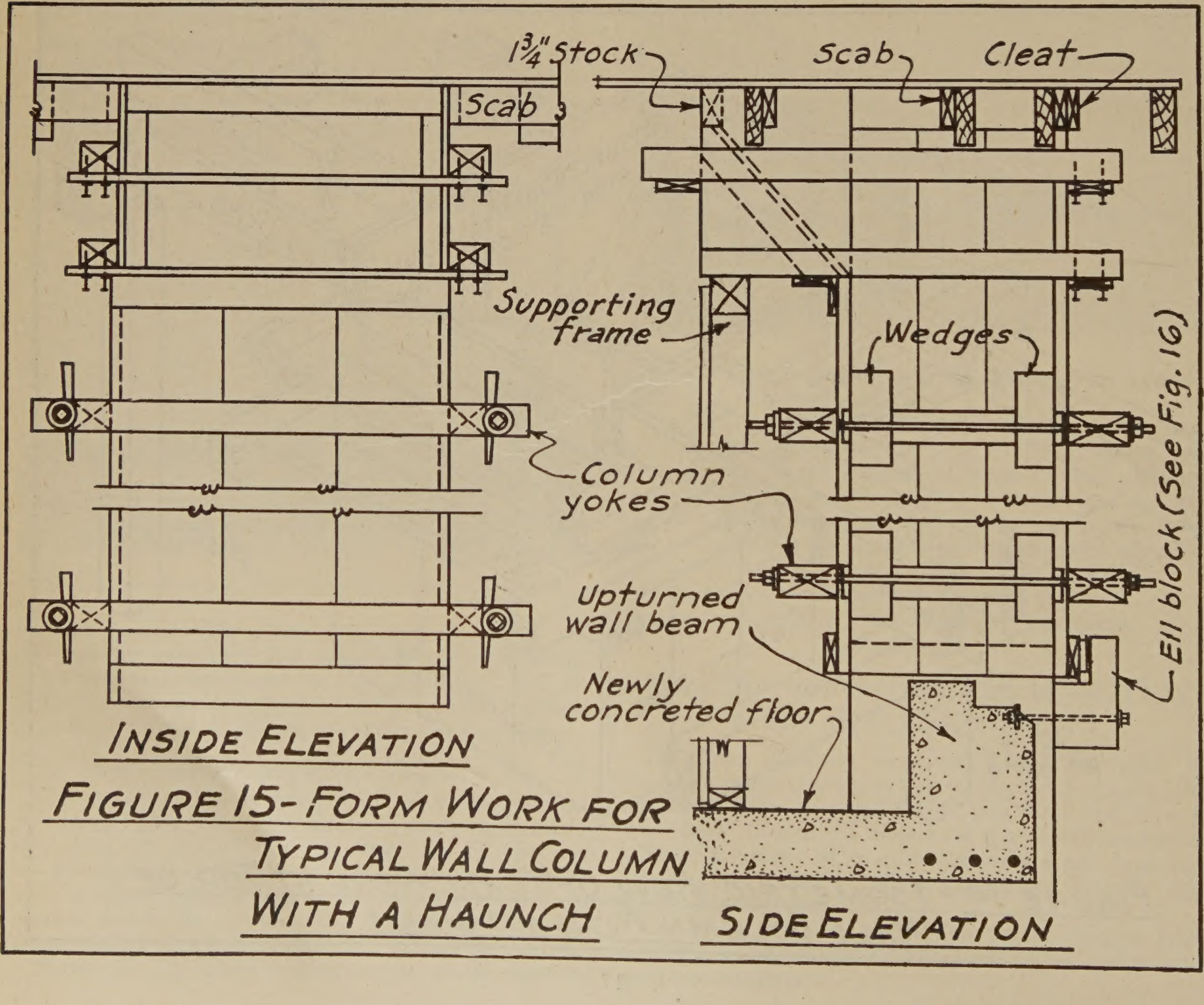
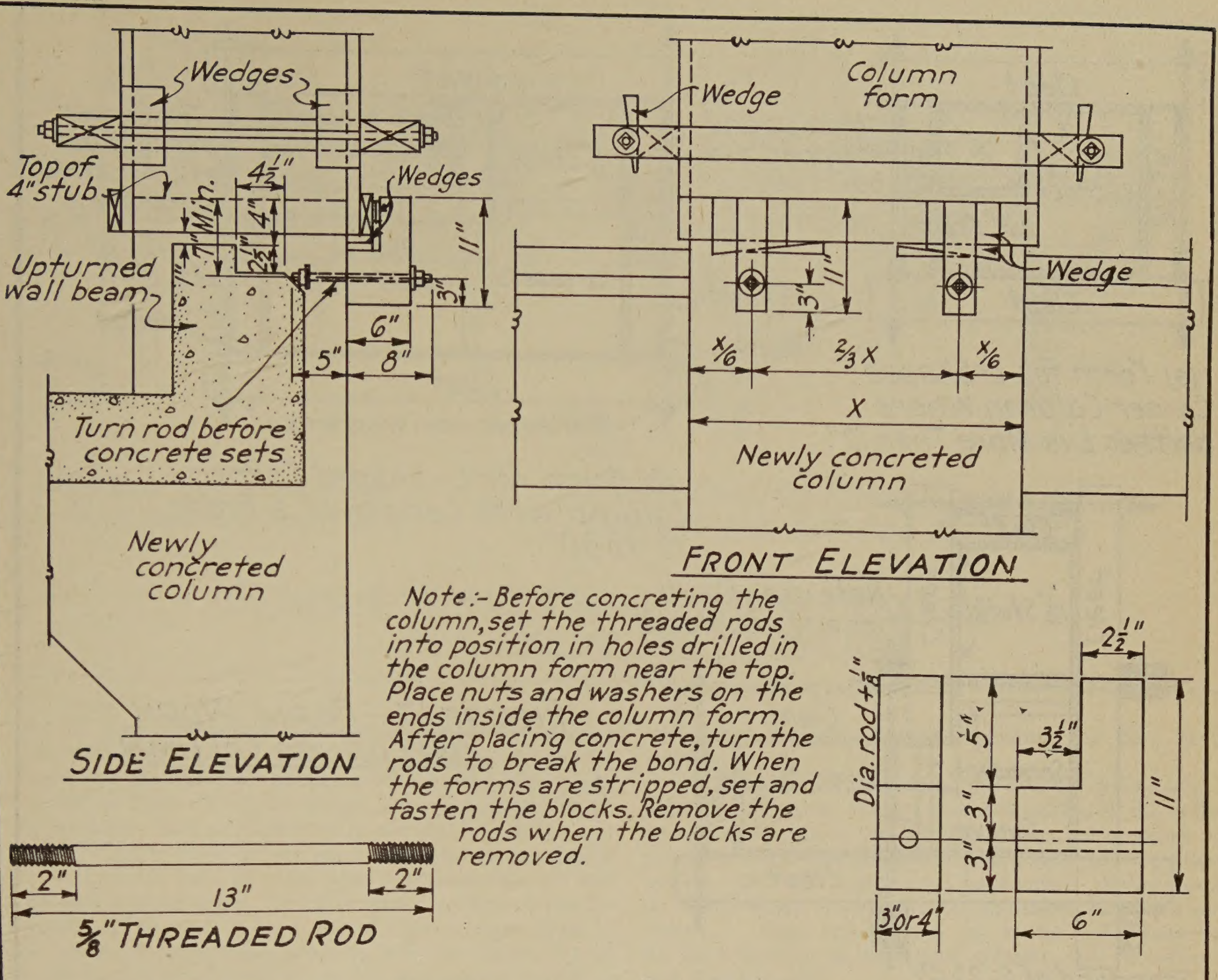


FIGURE 15- FORM WORK FOR TYPICAL WALL COLUMN WITH A HAUNCH



Note:- Before concreting the column, set the threaded rods into position in holes drilled in the column form near the top. Place nuts and washers on the ends inside the column form. After placing concrete, turn the rods to break the bond. When the forms are stripped, set and fasten the blocks. Remove the rods when the blocks are removed.

FIGURE 16 - DETAILS OF "ELL" BLOCKS TO SUPPORT COLUMN FORM

Figure 14 is an isometric view of the form work at the top of a wall column which is not to be integral with the wall itself. This happens to be a wall column in a building of flat-slab design, but the details would be essentially the same for a wall column in a building of slab-and-girder construction. Provision is made for the haunch or bracket, at the junction between the column and the floor slab. Or, if this were a slab-and-girder building, the haunch would be at the junction of the column and the girder that is to be framed into it. The form work for the same column is shown in elevation in Figure 15. The form as here detailed will of course extend up to the bottom of the slab or girder just mentioned.

The details of Figure 14 should be studied carefully and compared with the corresponding details in Figure 15. Various parts of the form work may in this way be recognized in each figure, and the details fixed in the reader's mind.

Because provision must be made to support the forms for the wall beams, a yoke can not be placed around the extreme top of the column form. It is therefore necessary to nail 1-by-3 or 1-by-4 scabs against the form joists, butting the scabs against the top of the form boards and the sides of the haunch forms to prevent bulging. These scabs are illustrated most clearly in Figure 14, but may be seen also in Figure 15.

Observe that sash strips must be tacked against the inside of the column form to provide a means for fastening the window sash if there is no intervening wall space between the column and the edge of the window opening. If there is such a wall space, a similar but larger piece (a 2-by-4 beveled at each edge) should be placed to provide a key for the wall. This, of course, is on condition that the panel wall is not to be monolithic with the column, or that it is built of masonry units. In the latter case the key will be helpful in anchoring the masonry units to the panel wall.

Holding the Column Form in Position

In the case of interior columns, the column form rests on the newly concreted floor, so that no special problem is involved in supporting it. The form for the outside panel of a wall column, however, must be temporarily supported by the newly concreted column in the story below. After the column form is completely assembled it is supported by the floor. This temporary support for the outside form panel is furnished most conveniently by two "Ell" blocks bolted against the outside and near the top of the wall column below.

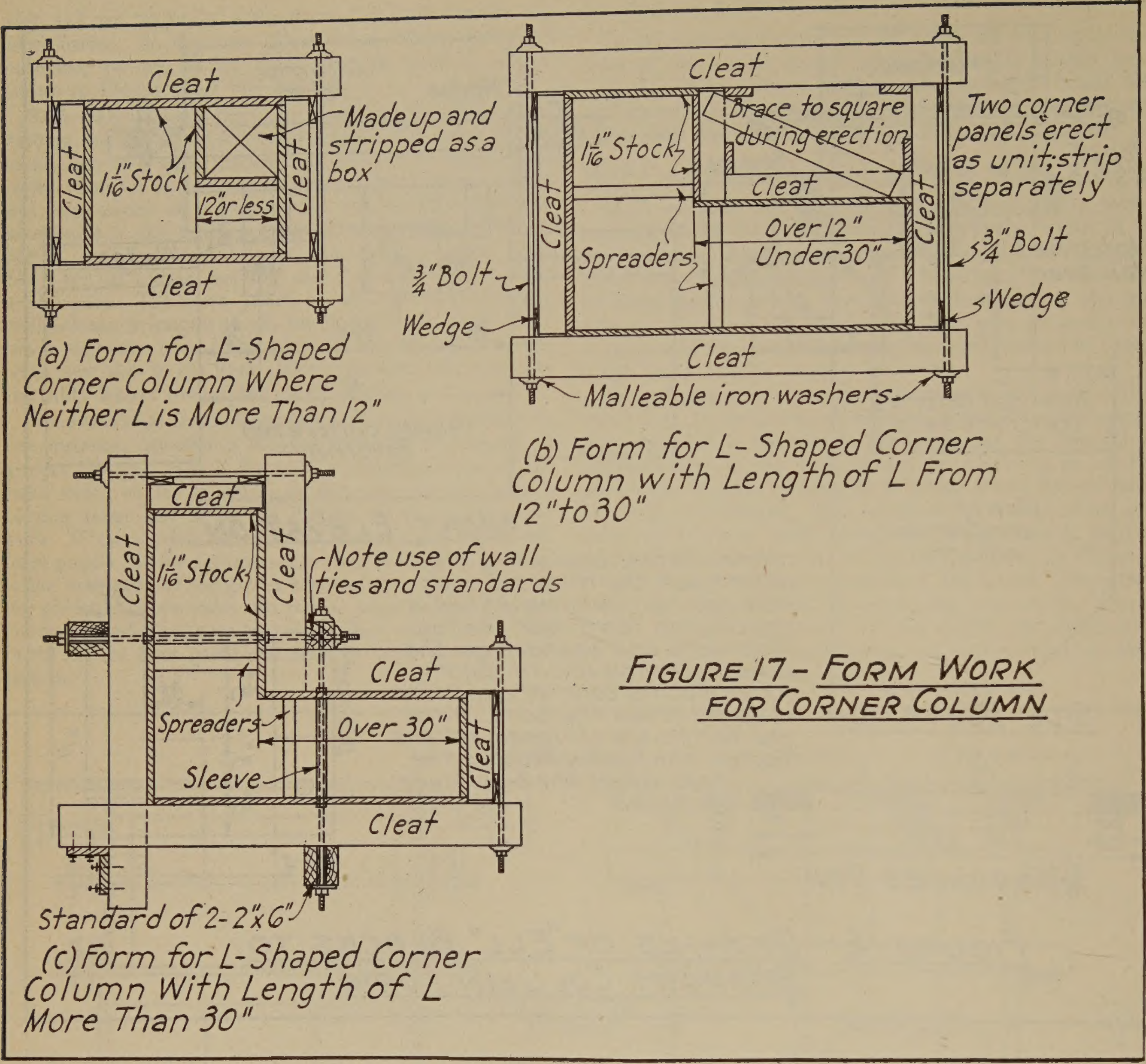

Cleat
Made up and stripped as a box
$1\frac{1}{16}$" Stock
12" or less
Cleat
(a) Form for L-Shaped Corner Column Where Neither L is More Than 12"
Cleat
Brace to square during erection
Two corner panels erect as unit; strip separately
$1\frac{1}{16}$" Stock
Cleat
Over 12" Under 30"
Spreaders
$\frac{3}{4}$" Bolt
Wedge
Cleat
Malleable iron washers
(b) Form for L-Shaped Corner Column with Length of L From 12" to 30"
Cleat
$1\frac{1}{16}$" Stock
Note use of wall ties and standards
Cleat
Spreaders
Over 30"
Sleeve
Cleat
Standard of 2-2"x6"
(c) Form for L-Shaped Corner Column With Length of L More Than 30"

FIGURE 17 – FORM WORK FOR CORNER COLUMN

The principal use of the "Ell" blocks, however, is not for supporting the outside column form while it is being erected, but for the much more important purpose of holding the bottom of the column form firmly against the surface of the concrete below. If these "Ell" blocks are not provided and the bottom of the column form is not bolted securely to the face of the column below which has previously been concreted, the bottom of the form will be forced out by the pressure of the fresh concrete in the new column, leaving an unsightly projection which is both difficult and costly to remove. The use of the "Ell" blocks greatly reduces this movement.

The "Ell" blocks, which are made out of short pieces of 3-by-6 or 4-by-6 timbers, are detailed in Figure 16 and are also shown in position in Figure 15.

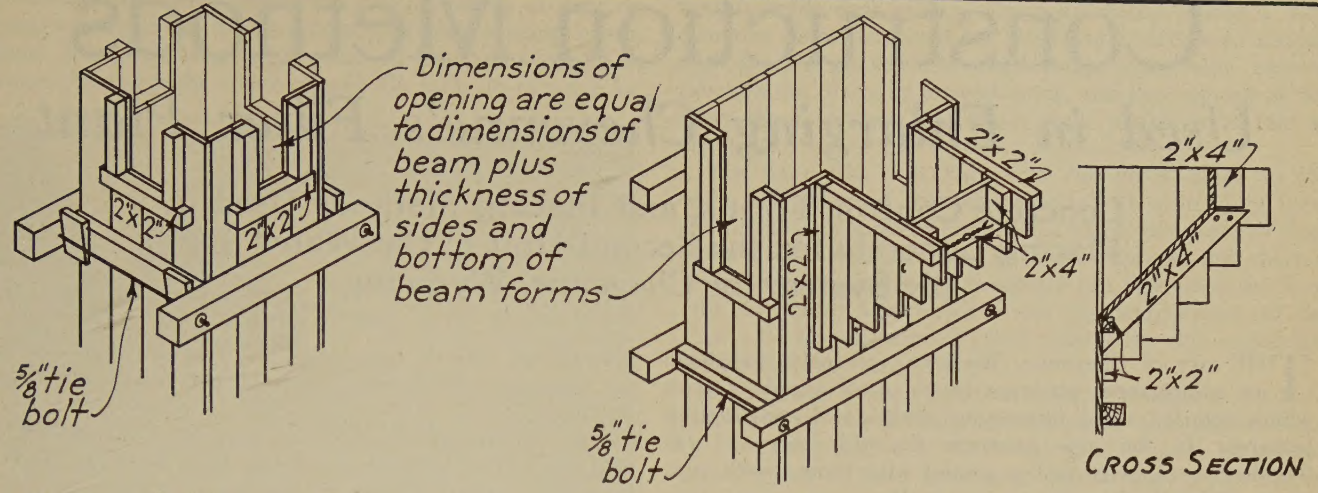
In order that the bolts holding the "Ell" blocks may be removed later, they are made of rods threaded at both ends. The rods are of course placed into position, in holes drilled in the column form, before the column is concreted. After the rods are inserted, a nut and washer are placed on the end inside the column form. Shortly after the column is concreted the rods are turned to break the bond with the concrete in contact with them, so that they may be removed later. After the column form is stripped these threaded rods are still in position, whereupon the "Ell" blocks are placed into position and bolted against the column, to provide a support for the column forms in the next story above.

Erecting the Column Form

The outside and inside panels of the column form, as explained previously, will probably not need to be altered unless there are variations in story height, as they are used from story to story. Consequently the cleats of the column yokes may serve as battens to which the form boards of these two panels are nailed. The outside form panel is then set into the notches of the "Ell" blocks, is adjusted to the proper level by wedges (See Figure 16), and held in a true upright position by 2-by-4 bracing extending back over the floor. The other panels are then set and the yokes are placed as described and illustrated for interior columns in the article preceding this one.

After the "Ell" blocks have served their purpose they are taken off and the threaded rods are unscrewed and removed, the imbedded nuts and washers remaining imbedded. The holes are filled with mortar in due time, when other filling and patching is done.

The details for the corner column forms, shown in Fig-


Dimensions of opening are equal to dimensions of beam plus thickness of sides and bottom of beam forms
5/8" tie bolt
2"x2"
2"x2"
5/8" tie bolt
2"x2"
2"x4"
2"x2"
2"x4"
2"x4"
2"x2"
Cross Section

(a) Top of Column Form Notched for Beams

(b) Top of Column Form Detailed for Haunch and Notched for Beams

Figure 18 - Top of Column Forms Notched for Beams and Haunches

ure 17, are so clear that little description will be needed. The method of erection will be much the same as with the forms for regular wall columns, except when the length of one or both L's of the corner column exceeds 30 in. In the latter case, as illustrated in the detail designated as (c) in Figure 17, it is our practice to use forms similar to wall forms, held in place with a combination of wall ties and column yokes. In cases where neither of the L's exceeds 30 in., but at least one of them is more than 12 in., we use column yokes alone to hold the forms, but we build the form L-shaped by means of a special corner as shown in detail (b) in Figure 17. Where neither of the L's exceeds 12 in. we make up an ordinary rectangular column form and set a box in the corner, as shown in detail (a) of Figure 17.

Near the beginning of this article there is some discussion of the notching of the tops of column forms to provide for the beams or girders framing into them. Figures 14 and 15 also show the form details for a haunch at the top of the column. Because of the importance of these form details for notches and haunches it will be well to illustrate a few cases separately so that they may be studied by themselves.

A few typical details are illustrated in Figure 18. These should be sufficient for the guidance of the form work crew in handling similar work. It would be impracticable to attempt to illustrate all possible cases of this kind.

Attention may again be invited to special devices offered on the market, such as yokes, clamps, ties and similar form work specialties, many of which are useful for special purposes.

Cement Institute Opens Two Division Offices

The Cement Institute, organized in the latter part of 1929 with a head office at 11 East 44th Street, New York, opened division offices at Chicago and Kansas City on February 1st.

The Institute has been formed primarily as a statistical organization, for the purpose of collecting statistical data within the industry and disseminating the data to its members.

The Institute has nothing to do with the price, sale or delivery of cement, but is concerned only with the collection of information concerning credits, information on contracts and commitments for future delivery of portland cement, and data concerning production, clinker stocks on hand, cement stocks on hand, shipments and cloth sack returns. Other information on trade and commerce, having a bearing on the cement industry, will be collected and disseminated.

Rules and regulations governing fair trade practice within the industry have been drawn up in the form of a code of ethics, to which all member companies have subscribed.

The work of this statistical organization is in no sense a duplication of the work of the Portland Cement Association, which is primarily a research and promotional organization. There is no connection between the two organizations.

Fifty cement mills comprised the membership of the Cement Institute as of February 25th. Blaine S. Smith, president of the Pennsylvania-Dixie Cement Corp., is president of the Institute; Morris Kind (Hercules Cement Corp.) is vice-president and treasurer; three other vice-presidents are M. C. Monday (Hermitage Portland Cement Co.), Charles Irvin (Alpha Portland Cement Co.), and J. A. Lehaney (Lone Star Cement Company of Kansas). These officers are ex-officio members of the board of trustees, other members of the board being G. S. Brown, president of the Alpha Portland Cement Co., George F. Coffin, treasurer and general manager of the Nazareth Cement Co.; Charles Schmutz, vice-president of the Bessemer Cement Corp., and Col. E. M. Young, president of the Lehigh Portland Cement Co. Col. William J. Donovan is counsel for the Institute.

Luther G. McConnell is general manager of the Institute, with headquarters at the New York office. George H. Reiter is manager of the division office at 176 W. Adams St., Chicago, and Baxter D. McClain is manager of the division office at Kansas City.

Construction Methods
Used in Enlarging Cheyenne's Filter Plant

Concrete Control, Forms, and Placing Methods Used in Placing Concrete for the Second Unit in the Water Supply System for Cheyenne, Wyoming

THE city of Cheyenne, Wyoming, recently completed an enlargement program to its water supply system which entailed some interesting design and construction features. In the new program the old reservoir was doubled in capacity and a second filter house with supply and distributing systems was built.

The city is more than 6,000 ft. above sea level and is located on a plateau which is part of the Laramie Range. Because of the general elevation of the city, the reservoir is located at some distance from the city on a butte high enough to give gravity flow to the water. This butte on which the reservoir stands is partly natural and partly artificial, most of the new reservoir being on fill.

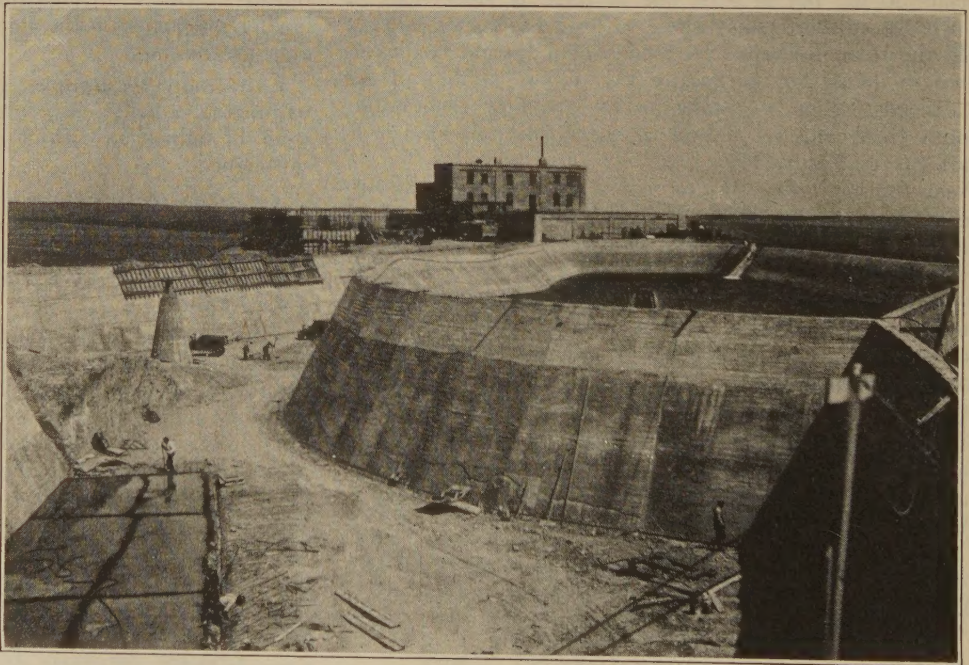
The water used by the city is impounded in the hills 25 miles from Cheyenne and is brought by pipeline to the reservoir. From the reservoir a double distributing system is now in use so that the supply can be switched to either the old or the new reservoir and filter house.

Old Concrete in Good Condition

The old reservoir is roughly pear-shaped, conforming to the shape of the butte. The new reservoir lies alongside the long axis on the old reservoir and with three new walls forms a somewhat peanut-shaped basin. The old reservoir was built in 1915 and was found to be in excellent condition. When work began on the new basin one wall of the old reservoir was uncovered and given a 1-in. coat of gunite. The old wall was found to be sound throughout without laitance or construction seams so that no renovating work was necessary before the gunite was applied.

The construction of the walls presented no difficult operations. The artificial butte has been built up and allowed to settle. The earth has been carried up to the height of the walls so the inside of the fill was trimmed off to conform to the slope of the basin walls. In the placing operations no forms were used against the earth so that the contractor has to pave only inside forms in placing the walls.

The walls were built in three lifts, using wood forms of short sections so that shifting operations were simplified. The walls are uniformly 7 in. thick and are reinforced with ½-in. bars placed both ways on 12-in. centers. Since the slope of the wall is ½ to 1 the only difficulty was to keep the reinforcing correctly in place during placing operations.



The filter beds were enlarged by building new walls alongside the old filter walls. The space between the two walls was paved as described

The lower lift of the wall was designed with a notch for the floor and reinforcing steel from the wall, in the form of bent bars, was carried out of the notch to be incorporated in the floor slab. During the work on the walls and throughout grading operations on the earth subgrade of the floor, these projecting bars were bent up against the wall to prevent tearing the concrete.

The engineer and the contractor co-operated in eliminating construction seams between wall lifts. Before the second lift was made the edge of the concrete below was brushed and washed clean and a thin coating of neat cement was applied just in advance of new placing operations. When the forms were removed this care was plainly shown by the tight concrete and all lack of laitance between lifts. All the new walls were given a 1-in. coat of gunite after the concrete had air cured.

Placing concrete for the floor. The portable mixer operated around the rim of the basin. Concrete was chuted to buggies which transported the concrete to position

The Floor

The floor system designed for the new basin is especially interesting. It is in fact a beam and slab design similar to any beam and slab floor system and has, in addition, an auxiliary supporting force from the subgrade. Before any work was done on the floor the basin was divided off into sections which could be set apart for placing operations and all work other than that on the floor was excluded from the section being worked in.

The subgrade was carefully brought to grade with as much care as is found on any concrete road job. Then a system of supporting beams was laid off, gridiron fashion, and trenches for the beams were cut into the subgrade. These beams are rectangular in shape and are 12 in. wide by 19 in. deep. The beams are placed 14 ft. on centers both ways of the basin.

Care was taken in digging the trenches to preserve the walls of the trench since no form work was contemplated for the floor system. When the trenches were cut and formed the subgrade inside the rectangle of beams was given a final finishing so that the floor slab might be as uniformly thick as possible.

Upon completion of these preliminary operations concrete for both floor slab and beams was placed simultaneously. The floor and beams were reinforced with ½-in. bars laid both ways of the slab. The only form work required was the use of headers around the section being placed. Rather than use a wood or steel form the contractor made each side of the panel being placed a construction joint and used for the form a deformed tongue and groove plate. The reinforcing bars were carried through the plate, as in road work, and bent up out of the way. As a general rule about eight panels were laid at one time.

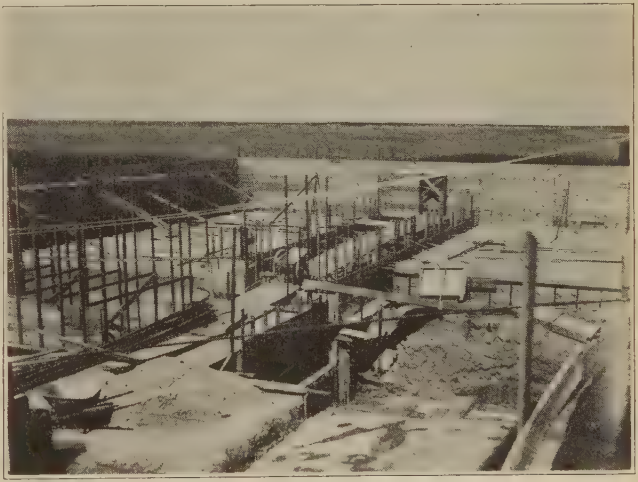
The floor slab was built into the notch made in the walls and the steel bars which were left protruding from the notch were made a part of the reinforcing of the floor system. An unusual feature of the floor is the absence of expansion joints. The designers felt that since the floor will be continually under water the temperature of the floor will be very uniform and contraction and expansion will be of very small extent.

Curing was given careful attention throughout the floor construction. As rapidly as one panel was finished and as soon as possible after finishing, the panel completed was divided off into rectangles approximately the size of the sections above the girders. Small earth dikes were built across the floor both ways and the floor was covered with water. This matter of curing was held highly important since the sun, high altitude and dry atmosphere of Cheyenne cause exceedingly rapid evaporation. Unless ponding had been used, an unusually heavy layer of earth would have had to be laid and the wetting of this heavy blanket would have cost considerably more in labor than ponding.

The concrete for the reservoir was mixed in a portable mixer which operated around the rim of the basin. As the concrete was mixed it was chuted down into the reservoir and buggied to position on the floor. In placing the walls the mixer was moved along the wall from time to time to reduce the amount of hauling. The mix was 1:2:4 using gravel as coarse aggregate. The details of handling the concrete are similar to those used for concrete work in the filter house.

The Filter House

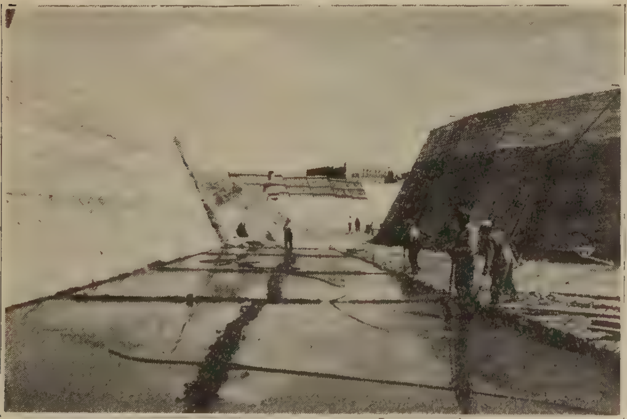
The water brought down from the hills is relatively soft, being a mixture of creek, snow and spring water. The pipeline from the hills enters the old filter house while the new line enters the new filter house. The water enters a first treatment chamber where alum is added. Then the water is passed to the sedimentation tanks where the alum settles out. From these tanks the water passes through the sand and gravel filters and then enters the reservoir. Before entering the supply line to the city the water goes through the valve house where chlorine is added.



Form work for the new filter house

The old filter house was rapidly becoming inadequate so the new filter was designed to care for calculated increases for some years to come. The new filter house is a reinforced concrete structure with concrete tanks and pits. The design of the structure was so drawn as to make use of the best practices in concrete construction. Prior to any concreting, samples of the materials were submitted and a proper grading of the materials for the various mixes employed was worked out. Too fine sand was prohibited, the specifications calling for all sand to pass the number 4 screen and not more than 40 per cent nor less than 20 per cent to be retained on the 10 mesh per linear inch screen. Both sand and gravel were obtained from a pit located near the plant and were separated by screening.

No forms were used in casting the floor. The subgrade was brought to exact grade and trenches were excavated for the beams as shown



Curing the floor slab. At the right is the old concrete wall, placed in 1915

The filter house is essentially a two-story monolithic structure 55 by 66 ft. The filters and tanks are at the first floor while the second story is given over to operating uses. The foundations of the structure are all monolithic concrete carried down to rock in that part of the butte which is natural and to firm foundation where the butte is fill. Above the basement pits is a reinforced concrete first floor.

The footings of the filter house are 2 ft. 6 in. wide and 18 in. thick. Above the footings a monolithic concrete wall 18 in. thick is carried up to the level of the filter floors. The filters are 22 ft. 6 in. wide and extend the length of the filter house. The filter floor is 6 in. thick and is carried on longitudinal beams supported in turn on 3-ft. concrete girders. The floor, beams and girders are reinforced concrete.

The side walls of the filters are 12-in. concrete and extend up on the outside of the roof line. The roof is a 4-in. concrete slab supported on the outside walls and from 18-in. longitudinal girders of the operating house. There is quite a weight on the filter floors since the filter is composed of a 10-in. layer of gravel and a 32-in. layer of sand. In addition to this material the floor carries the weight of the water flowing over the top and the filter material is saturated. The filter floor was designed to carry a live load of 860 lbs. per sq. ft.

Concrete Proportions

In constructing the filter house approximately 130 cu. yds. of plain concrete, 1:2½:5 mix; 800 cu. yds. of reinforced concrete, 1:2:4 mix and 500 cu. yds. of reinforced concrete, 1:2½:5 mix; 100 cu. yds. of waterproofed concrete were used. All of the material for this concrete came from a nearby pit and was separated into gravel and sand by screening. Both materials were washed and the gravel was carefully inspected for presence of poor material. Due to the relatively thin sections of the concrete walls throughout the filter house no coarse aggregate larger than 1¼ in. was permitted.

The plain concrete in foundations and footings was the 1:2½:5 mix. By keeping the water content low this mix gave good results and effected a saving in materials. The 1:2:4 concrete was used for all the reinforced work except in some isolated cases where the 1:2½:5 mix was used. Throughout the job the engineer and contractor cooperated to get a uniform concrete and kept the amount of water used as low as possible for the particular work being done. It was relatively easy to use a dry mix for the heavy walls, while slightly more water was required for the thin walls of the filters and the galleries. By specification a concrete using not more than 6 gallons of water per sack of cement was used.

This new filter plant and reservoir just about doubles the capacity of the old system. The engineer for the job was Paul R. Revis, city engineer for Cheyenne.

~ EDITORIAL ~

Three-Day Test for Portland Cement Mortar

SOME engineers associated with construction companies that do concrete work on a large scale are inclined to the belief that the 3-day mortar strength test, combined with the 7-day test, should replace the 7-day and 28-day tests now usually required on construction work.

Last September, Committee C-1 of the American Society for Testing Materials voted against this proposal. The adverse vote was based in part on the feeling that such a move would work to the disadvantage of high-silica cements, because the strength of such cements would be likely to increase more rapidly after 3 days than before.

Comments received from several well-informed engineers since that time have favored the inclusion of the 3-day test, not as a basis of rejection, but as advance information on what may be expected at later dates. In a few years sufficient information might be obtained to create confidence in the importance of the 3-day test and to permit it to be standardized. Dependence might then be placed entirely on the results of the 3-day and 7-day tests, coupled with the further provision that the 7-day strength shall be at least equal to the 3-day strength. The 28-day test would eventually be eliminated, thus avoiding long waiting now associated with that test.

Concrete Is More Than Fireproofing

AMERICAN designers of structural steel bridges and buildings have long ignored the fact that steel girders, beams and columns encased in concrete are much stronger than the same steel members considered alone. These same designers, after assuming that the concrete serves only as fireproofing or weatherproofing, have figured the steel sections to the last hundredths of a square inch!

In this important respect American design practice has been far behind European practice, as pointed out by P. W. Leisner in an article on page 29 of the February issue of CONCRETE.

Not only structural designers, but the cement industry in particular and the concrete construction industry in general, should therefore take a lively interest in the analysis of the load tests on full-size floor panels of concrete-encased structural steel construction, conducted under the auspices of the Western Society of Engineers during the latter half of 1929. These tests were described briefly on page 24 of our November (1929) issue. The committee having the work in charge is now preparing its report for early presentation to the Western Society.

Observers of the Gary tests are well aware that the beams and girders in the test structure were much stronger after being encased in concrete than before the concrete was placed. When city building inspection departments recognize this fact, steel buildings of the future, when required to be fireproofed, will be fireproofed with concrete. The combination will produce substantial economy.

Those Overdue Accounts

DURING a talk before the annual meeting of the Wisconsin Concrete Products Association, F. W. Zilisch, sales manager of the Milwaukee Concrete Products Co-operative Association, had something to say about past-due accounts. This co-operative association was organized about July 1, 1929. Six months later, on January 1, 1930, the past-due accounts carried by the association totalled only one-tenth the amount carried by the individual member companies at the time they were organized.

The lesson to be learned from this fact is so obvious that comment is quite unnecessary.

Stimulating Local Construction

REPORTS from many cities indicate that local committees representing civic organizations are doing effective work toward stimulating construction by checking up on prospective work which for some reason had not been advanced to the contract stage.

Prospective private work, no less than public work, is being investigated by these committees. For instance, if a proposed new sewer, a street paving project or the construction of an incinerator is lying dormant while awaiting some action by the city council, concerted effort may prod the council into action. Other public works department construction may be held because of delay in advertising for bids or delay in making the formal award to the successful bidder. All these formalities take time, but an aggressive and public-spirited committee can shorten the time.

Bringing about an early start on a few construction jobs which might otherwise be delayed will constitute a worthy accomplishment for a local committee in any community. Multiply the local effect in one town by any number of towns and cities, and you have the combined effect on the nation.

Current Activities of Organized Groups

TECHNICAL societies, research laboratories and trade associations are continually at work on problems that concern their respective professional groups or industries, and in many instances the problems in hand affect the manufacturer or the user of cement and concrete and allied materials.

Readers of this magazine have a direct interest in the solution of many of these problems, but have neither the time nor the facilities for keeping in touch with all current developments that may affect them. With this fact in mind, a very brief digest of the major activities of organized groups is given below. Obviously, this digest can include only a few of the major activities of these organizations.

Revised Specifications for Portland Cement

COMMITTEE C-9 of the American Society for Testing Materials is preparing a revision of the Standard Specifications and Test for Portland Cement (Serial designation: C 9-26). It is expected that the 1:3 mortar test will be modified to require a 7-day tensile strength of 275 lb. per sq. in., compared with the present requirement of 225 lb.; and that the new 28-day requirement will be 350 lb. per sq. in., compared with 325 lb. in the present specification. A special sub-committee has been appointed to study the question of limiting the lime content by the use of the molecular ratio of lime to silica, alumina and iron.

Specification for High Early Strength Cement

THE QUESTION of adopting a specification for high early strength portland cement, submitted to letter ballot by the American Society for Testing Materials, has been approved by a large majority. The proposed specification is now under consideration by Committee E-10, and if this committee takes favorable action the specification will assume the status of a tentative standard.

The proposed specification in its present form permits a maximum sulphuric anhydride (SO_3) content of 2.50 per cent, compared with 2.00 per cent in standard portland cement. There is no other difference in the chemical content of the two cements.

The 1:3 mortar test requirements for high early strength portland cement are 275 lb. per sq. in. in 24 hours, and 375 lb. in 72 hours, and the 28-day strength must be at least equal to the strength at 72 hours.

Increased Strength of Concrete-Encased Steel Beams

LOAD TESTS to determine the increase in the strength of steel beams and girders when encased in concrete were conducted under the auspices of the Western Society of Engineers during the latter half of 1929, as reported on page 24 of the November (1929) issue of CONCRETE.

Analysis of the test results has been completed and the report is now being prepared for presentation before a regular meeting of the Western Society of Engineers in the near future. It is said that the strength of the concrete-encased steel beams were substantially greater than the strength of the same beams when tested alone, before the concrete was placed.

Present design practice in this country takes no account of the added strength due to the concrete, considering this material only as fireproofing or protection against the weather. The results of the Western Society tests may revolutionize design practice in this respect, perhaps bringing it into line with European practice.

Permeability of Concrete

FOR MORE than a year the Research Laboratory of the Portland Cement Association has been conducting a series of tests to determine the degree of watertightness of various mixtures of concrete. The tests are being continued. The degree of watertightness is an important factor in the durability of concrete in structures for hydraulic power developments, harbor works, water supply, irrigation systems and related uses. In all such structures the real need for watertightness is to prevent the disintegration which results from the freezing of water in porous concrete, or the slow breaking down through dissolving of the cementing material in the concrete.

Shrinkage of Concrete Masonry Walls

MEASUREMENTS of shrinkage in walls of hollow concrete masonry units have been under way at the Research Laboratory of the Portland Cement Association for many months, and will be continued for some time to come. It is expected that these tests will furnish dependable information on the shrinkage action of concrete masonry walls, from which proper practice may be developed with the view of minimizing both the amount and the effect of shrinkage.

Identification Marks for Rail Steel Reinforcing Bars

THE MILLS comprising the membership of the Rail Steel Bar Association, Chicago, have established and are using a standard identification mark on all rail steel reinforcing bars. The mark consists of a miniature raised cross-section of a standard steel rail, rolled on the bar at every revolution of the roll. This places the mark at intervals of 2 or 3 ft., depending on the size of the roll. Some of the mills are adding a mill identification mark.

The adoption of this standard identification mark indicates a willingness on the part of these mills to comply with the American Society for Testing Materials Standard Specifications for Rail Steel Concrete Reinforcement Bars (Serial Designation A 16-14). The presence of the identification mark serves as a protection against bars of doubtful quality that are placed on the market as rail steel bars but which do not in fact meet the requirements of the A. S. T. M. specifications.

American Concrete Institute's New Orleans Meeting Records Advances

Cast Stone Institute and National Concrete Products Association Hold Meetings at Same Time—Discuss All Angles of the Concrete Construction Industry

THE twenty-sixth annual meeting of the American Concrete Institute, held at the Roosevelt Hotel in New Orleans on February 11th, 12th and 13th, attracted about 300 delegates from various sections of the country.

The Institute meeting was preceded on February 10th by the fifth annual meeting of the National Concrete Products Association and the second annual meeting of the Cast Stone Institute.

The practical application of the rules for making good concrete, construction specifications for concrete work on buildings and other structures of ordinary size, specifications for ready-mixed concrete, the design and operation of ready-mixed concrete plants, methods of curing concrete, winter concreting methods, volume changes in concrete masonry walls, designing concrete products plant for multiple-shift operation, floor finishing practice, and load tests on reinforced concrete columns, were some of the subjects that attracted discussion at the sessions of the Institute.

The number of delegates comprised only about one-half of the number at similar meetings in recent years in cities such as Detroit and Philadelphia. This may doubtless be ascribed to the fact that New Orleans is at a considerable distance from the geographical center of the membership of the Institute. Nevertheless, the feeling prevailed that the New Orleans meeting brought the work of the Institute more definitely to the attention of engineers and architects in the South and Southwest, and that the Institute is likely to spread the scope of its influence as a direct result.

New Officers

Duff A. Abrams, director of research, International Cement Corp., was elected president of the Institute; Arthur R. Lord, consulting engineer, Chicago, was elected vice-president for two years, and Harvey Whipple was re-elected secretary-treasurer. Directors elected for the first, second and sixth districts are R. B. Young, of Toronto; Cloyd M. Chapman, of New York, and Raymond E. Davis of Berkeley, California, each for a two-year term.

CONSTRUCTION WORK AND SPECIFICATIONS

The first session of the afternoon of February 11th was concerned largely with construction specifications, descriptions of construction work, and the production and use of ready-mixed concrete.

Construction Specifications

The papers on construction specifications included one by Arthur R. Lord, entitled "Construction Specifications for Concrete Work on Ordinary Buildings." This paper was in fact a report of Committee 502, of which Mr. Lord is chairman, and was published in full in the November (1929) issue of the "Journal" of the American Concrete Institute.

As announced in the "Journal" at the time of its publication, this specification is the first of a contemplated new series to be issued by the Institute. The discussion that followed the presentation of the paper was in general favorable to the idea of the development of specifications that are sufficiently condensed to be of practical use to the writer of specifications for buildings of ordinary size.

One speaker suggested that an even more condensed form of specification, for inclusion in a general specification at the point where structural concrete is covered, would be a valuable and practical addition to the Institute program.

A second paper on "Construction Specification for Supplying, Fabricating and Setting Reinforcing Steel" was presented by R. W. Johnson, engineer for the Concrete Reinforcing Steel Institute, in the absence of W. F. Zabriskie, author-chairman of Committee 503. This report, which was published in the February issue of the "Journal" of the American Concrete Institute, explains the manner in which steel reinforcement should be detailed and scheduled on plans in order to fit in with the practice and methods of the distributor of reinforcement. This specification, like its companion specification previously presented by Mr. Lord, is intended to be incorporated as a whole in the specifications for a structure at the point where steel reinforcement is covered. Or, if the architect so desires, the specification can be incorporated by reference. For the case where the specification is to be adopted by reference, specification writers will find in the paper the actual wording to be employed.

Large Size Coarse Aggregate

Much interest was manifested in a paper by I. E. Burks, concrete technician for the Alcoa Power Company, Kenogami, Quebec, describing the Chute á Caron dam in the Saguenay River in Quebec, about 80 miles above its mouth at the St. Lawrence River, and 25 miles below Lake St. John. The site of the dam is about 125 miles due north of the city of Quebec. Particular interest was shown in the use of three different grades of concrete in this gravity section dam, in the use of coarse aggregates of large size, and in the precautions against the extremely cold weather of that region, where concreting is being carried on in temperatures often ranging from 30 to 50 degrees below zero Fahrenheit.

The concrete for the Chute á Caron dam is made in three grades, known as Class A, Class B, and Class C. Class A concrete is designed for a compressive strength of 3,000 lbs. per sq. in. at the age of 28 days, and the maximum size of coarse aggregate is 6 in. Class B concrete is designed for a compressive strength equal to that of Class A, but the maximum size of coarse aggregate is 3 in. Class C concrete is designed for a compressive strength of 1500 lbs. per sq. in. at the age of 28 days, the maximum size of coarse aggregate being 6 in.

The greater part of the dam construction consists of either Class A or Class C concrete, the latter class being used in the central part of the structure, with Class A concrete in the base, on both up and down stream faces, and at the top. Class B concrete was used only in parts of the dam and power house where the amount and spacing of reinforcing steel and the size of the members prevented the use of the 6-in. aggregate.

The aggregates are being taken from the construction site. According to the author a considerable saving in cement (or cement paste) was made possible through the use of this coarse material. The construction work is in charge of the construction department of the Aluminum Company of America, of which the Alcoa Power Company is a subsidiary. Mr. Burks' paper was printed in full in the February issue of the "Journal" of the American Concrete Institute.

READY-MIXED CONCRETE—SPECIFICATIONS AND OPERATION

Ready-mixed concrete came in for consideration in two papers. One paper, covering "Specifications for Centrally Mixed Concrete," comprised a report of Committee 504 by the author-chairman, Miles N. Clair, of the Thompson & Lichtner Company, of Boston, Mass. A second paper covered the "Design and Operation of Central Mixing Plants."

One point brought out in the discussion of ready-mixed concrete was that a distinction must now be made between centrally mixed concrete, which is delivered to the trucks at the central mixing plant, and concrete which is mixed in transit by special trucks built for the purpose.

A considerable part of the discussion centered around the practice in Philadelphia, where the use of ready-mixed concrete has been sanctioned by the Bureau of Building Inspection, and where one company alone marketed some 250,000 cu. yds. during 1929. The concrete furnished by that company is centrally mixed; that is, the material is delivered to the trucks in completely mixed form and is kept agitated on the way from the central plant to the point of delivery.

Mr. Clair's report is printed in the February "Journal" of the Institute.

CURING CONCRETE AND CONCRETE PRODUCTS

The morning session of Tuesday, February 11th, included two papers on the subject of curing concrete. The first was by H. F. Gonnerman, manager of the Research Laboratory of the Portland Cement Association, and was entitled "Study of Methods of Curing Concrete."

Curing Concrete Pavements

Mr. Gonnerman described a series of tests, undertaken by the research laboratory of the Portland Cement Association, for the purpose of determining the effect on the compressive and flexural strength, wear and surface hardness of concrete, of some of the different commercial and improvised methods of curing concrete now in use, more especially in connection with concrete pavements. The tests included 17 different methods, which may be grouped into four general classes. The first class is water curing; the second class comes under the heading of surface coatings; the third class includes calcium chloride admixtures; and the fourth class includes surface covering of calcium chloride.

The water curing specimens were left in the mold one day, covered with burlap, after which they were placed either in water or in a moist room or in air with 50 per cent humidity, with the temperature maintained at 70 degrees Fahrenheit.

In the test of surface coatings the top surfaces of the specimens were sprayed with the coating material immediately after finishing, but no other protection was provided during the first day. With one exception, the specimens were removed from the molds at the end of one day and placed in air at 50 per cent humidity until tested. Eight different commercial preparations were tested under this classification.

The third set of tests included two specimens in which calcium chloride to the amount of 2 per cent of the weight of the cement had been placed as an admixture. The first specimen was left in the molds one day, in an uncovered condition, then the forms were removed and the specimen was stored in air at 50 per cent humidity until tested. The second specimen was left in the mold one day under a covering of wet burlap, then stored in water until tested.

In the test for the effectiveness of calcium chloride surface covering, the single specimen was left in the mold one day, during which it was covered with wet burlap, after which the top surface was covered with calcium chloride at the rate of 2½ lbs. per sq. yd. of surface. The specimen was left in the mold in air at 50 per cent humidity until tested.

An outstanding feature of the results of the test was that six of the commercial coatings indicated approximately the same compressive strength at the various ages as specimens cured in the moist room of the laboratory for 13 days. At the age of 3 months these same six specimens had compressive strengths ranging from 75 to 85 per cent of the average strength of specimens cured continuously under water for 3 months. A similar comparison at the age of one year resulted in compressive strengths ranging from 58 to 76 per cent of the strength of specimens cured continuously under water.

Rather interesting confirmation of the results just noted came during the discussion when D. D. McGuire, testing engineer for the Tennessee State Highway Department, made reference to a report soon to be published on a long series of curing tests made by the Department in cooperation with the Bureau of Public Roads. The tests described by Mr. McGuire cover 17 miles of concrete highway and the conclusions to be drawn will be based on a total of 128,000 beam tests of highway slabs, besides a number of core tests and wear tests. Mr. McGuire stated further that they had found five commercial agents that gave better results than water.

Mr. Gonnerman's paper was published in full in the February "Journal" of the Institute.

High Pressure Steam Curing for Concrete Products

A second paper on curing methods dealt with the subject of "High Pressure Steam Curing in the Manufacture of Concrete Masonry Units." This paper was prepared by P. M. Woodworth, assistant engineer, Research Laboratory, Portland Cement Association, and was published in full in the February "Journal" of the Institute. Owing to the absence of the author, the paper was presented by title only and was not discussed on the convention floor.

Mr. Woodworth's paper describes a series of tests undertaken at the plant of the Crume Brick Co., Dayton, Ohio, to determine the effect of high pressure steam curing on the early strength of concrete units, on the ultimate strength, and on the strength as affected by the time interval between molding and curing. In addition to the strength test, shrinkage measurements were made on small masonry panels built with units cured in steam at high and low pressure. The Dayton plant was selected for these tests for the reason that in the manufacture of tile the molds are vibrated to consolidate the concrete, and the plant has facilities for both low pressure and high pressure steam curing.

WINTER CONCRETING METHODS

The subject of winter concreting was covered in a report of Committee 604, by R. C. Johnson, of the Immel Construction Co., Fond du Lac, Wisconsin, author-chairman of the Committee. The report was published in full in the February "Journal" of the American Concrete Institute. As previously stated, winter concreting was also up for discussion following the paper presented by I. E. Burks in connection with his description of the concrete dam north of Quebec.

During the discussion of Mr. Johnson's paper a lively argument occurred over the maximum temperature which should be permitted in placing concrete in winter. Several speakers contended that temperatures as high as 105 degrees Fahrenheit might in some cases result in flash set. Other speakers claimed that cements varied in this respect and that at least some brands of cement could safely be used on work on which the concrete, when placed, has a temperature of as much as 150 degrees Fahrenheit.

Mr. Johnson's report should be of particular interest to contractors in northern climates. Because of his connection with a large construction organization that operates largely in northern climates he was careful to handle his subject from the standpoint of the construction superintendent. His report covers in considerable detail the actual methods to be employed, not only in getting the concrete placed at a proper temperature, but in keeping it protected after it is placed.

Variations in Standard Portland Cements

P. H. Bates, of the United States Bureau of Standards, Washington, D. C., in his capacity as author-chairman of Committee 202 of the Institute, presented a paper on "Variations in Standard Portland Cements," which was published in full in the November, 1929, issue of the "Journal" of the Institute.

Mr. Bates' paper describes tests on a number of portland cements for the purpose of determining variations in early strength, variations in later strength, differences in permeability, variations in workability, variations in reaction with natural stone, differences in the amount of shrinkage and plastic yield, variations in the amount of chemical heat developed during the setting of large masses of concrete, differences in reaction to curing conditions, and variations in color.

The paper, as printed in the "Journal," contains a discussion by Thaddeus Merriman, chief engineer of the Board of Water Supply of the City of New York. Mr. Merriman takes the position that not all standard portland cements are equally suitable for use in concrete that will be exposed to severe weather conditions, or to the action of sea water, or other hard usage.

SESSION ON CONCRETE PRODUCTS INCLUDES VARIETY OF SUBJECTS

The morning session of February 12th was given over largely to papers and discussions on concrete products and cast stone.

Volume Changes in Concrete Masonry

The first paper, by W. D. M. Allan, manager of the Cement Products Bureau of the Portland Cement Association, was entitled " A Study of Volume Changes in Concrete Masonry Walls." The paper was a report on tests that have been under way for many months at the Research Laboratory of the Portland Cement Association. In Mr. Allan's talk, which was illustrated by a number of lantern slides showing results of the tests, he emphasized the danger of laying concrete units that are not completely cured. Most of the curves shown on the screen indicated a fairly rapid shrinkage for the first 28 or 30 days, indicating that under ordinary conditions of curing this age should be obtained before the units are laid in a wall. Modern methods of steam curing, however, may greatly reduce the age at which units can safely be used.

Recommended Practice for Manufacture

A report presented by P. M. Woodworth, chairman of Committee 708, comprised the "Recommended Practice for the Manufacture of Standard Concrete Masonry Units." This new recommended practice was published in full in the February "Journal" of the Institute. Because of the absence of the author-chairman the report was presented by title only and was not discussed.

Recommended Practice for Use of Cast Stone

A report entitled "Recommended Practice for the Use of Cast Stone," prepared by Louis A. Falco, chairman of Committee 704 of the American Concrete Institute, was presented by title.

Color in Concrete Products

Considerable interest was shown in a report on "Color in Concrete Products," prepared by Raymond Wilson, author-chairman of Committee 703. Because of the absence of Mr. Wilson, the paper was read by C. G. Walker.

Multiple Shift Operation for Concrete Products Plants

A lively discussion followed a paper on the subject of "Plant Design for Single or Multiple Shift Operation," presented by Benjamin Wilk, of the Standard Building Products Company of Detroit. Mr. Wilk is author-chairman of Committee 707.

In favor of the multiple shift plant, the author called attention to the slightly lower investment, but against this advantage he listed disadvantages such as higher pay for men on night work, more breakage on night shifts, more accidents and more careless use of machinery, and the necessity for additional supervision if the quality of the product is to be equal to that of the day shift.

The author expressed himself in favor of single shift plants because of their supposedly greater flexibility in handling machines, more uniform production, better quality of products, opportunity to meet unexpected demands, less machinery trouble, better supervision, and lower unit cost of production.

Other speakers contended that a plant which has been designed for single shift operation is not a proper basis of comparison when this same plant is put under multiple operation. The claim of these speakers was to the effect that multiple shift operation, in order to be successful, must be designed primarily for that character of operation. In a plant so designed, it was contended, most of the objections raised by the author disappear and the advantages outweigh the disadvantages.

Mr. Wilk's paper was published in the February issue of the "Journal" of the American Concrete Institute.

REINFORCED CONCRETE COLUMN TESTS

The evening session of February 12th included a report by Prof. W. A. Slater, of Lehigh University, on progress thus far made in the tests of reinforced concrete columns. Part of this work, which was placed on the Institute program a year ago, is under way at Lehigh University, and part of it at the University of Illinois.

Most of the tests thus far made were on columns with a core diameter of 8 in. and a length of 5 ft. These were supplemented by other tests on columns of larger diameter, with core diameters up to 28 in. In all cases, the length of the test specimen was 7½ times its core diameter.

The report presented by Prof. Slater, who is chairman of Committee 105, was primarily a progress report, and will of course be followed at a later period by more complete reports. An attempt is to be made to raise a special fund to carry these tests forward more expeditiously and on a more elaborate scale than has so far been attempted.

FINISHING CONCRETE FLOORS

An interesting paper, accompanied by lantern slides illustrating the finishing of concrete floors, was presented by John G. Ahlers, chairman of Committee 802, and by W. E. Hart, secretary of the same committee.

Mr. Hart's contribution to this program consisted of a number of lantern slides and a verbal discussion of some of the tests and investigations on which part of the paper presented by Mr. Ahlers was based. After the lantern slides were shown and the construction methods discussed, Mr. Ahlers followed with a paper entitled "Good Practice in Concrete Floor Construction." The paper is an excellent treatment of this subject. It includes a set of specifications for heavy-duty floor finish, followed by specifications for dusted-on floor finish. The specifications for heavy-duty floors contain notes where the specifications may be modified for light-duty floor finishes.

Inferior floor finishes, this paper concludes, are caused by—

(1) Use of too much mixing water.
(2) Too much manipulation (screeding, floating, troweling) of the wet mix, bringing fine particles and laitance to the surface.
(3) Too high a percentage of fine particles (passing the 50-mesh screen) in the sand.
(4) Improper curing.

As a means toward producing good floor finishes, the following practice is recommended—

(1) Limit the mixing water to not more than 5 gallons to the sack of cement, and improve workability by longer mixing.
(2) Use only coarse sand.
(3) Use not less than 1½ parts of coarse aggregate.
(4) Avoid floating or troweling the surface while it is wet and sloppy.
(5) Delay the finishing operation, after screeding, from 30 to 45 minutes, or until all surface water has disappeared.
(6) Cure the finish for not less than 7 days.

MISCELLANEOUS DESIGN AND CONSTRUCTION SUBJECTS

Deflections of Reinforced Concrete Members

A report by T. D. Mylrea, author-chairman of Committee 307, covered the subject of deflections of reinforced concrete members. The paper included a discussion of the variables that enter into this question, and set forth some of the difficulties involved in the effort to arrive at definite conclusions.

Tall Building Design

The report of Committee 405, prepared by R. R. Zipprodt, author-chairman, on the subject of "Economics of Tall Building Design," was presented by W. E. Hart, because of the absence of the author. This paper covered the essential details involved in the economics of tall building design, and the special application of the reinforced concrete structural frame as an important element in this question.

Descriptions of Construction Work

The afternoon session of February 13th was taken up in part by papers describing specific construction projects on a large scale. Captain Helmer Swenholt, Corps of Engineers, United States Army, described the design and construction of Bonnet Carre Spillway, and Lieutenant Morris W. Gilland, Corps of Engineers, United States Army, described at considerable length the concrete casting plant where concrete revetment mats are being cast for use in bank and levee protection along the Mississippi River. Lieutenant Gilland's paper included also a detailed description of methods employed in placing the mats from the decks of the barges upon which they are cast. Both these papers were illustrated with slides. J. B. Converse, consulting engineer of Mobile, Alabama, followed with a paper on the design of gulf shore protection structures. He described the various types of structures employed in the past, and discussed details of improvements which are being made as compared with the earlier designs.

Business Session of the Institute

The papers presented during the afternoon session of February 13th were preceded by the business session of the Institute, resulting in the election of the officers previously mentioned. The 26th annual dinner at the Roosevelt Hotel concluded the convention. Milwaukee was selected as the place for the annual meeting of 1931.

Program of Concrete Reinforcing Steel Institute

The program for the sixth annual meeting of the Concrete Reinforcing Steel Institute, to be held at the Bon Air-Vanderbilt Hotel in Augusta, Georgia, from March 31st to April 2nd, indicates that considerable time will be given to discussions of interest to the concrete construction industry in general.

Among the papers scheduled is one on "Co-operation in the Building Industry," by Colonel George B. Walbridge, vice-president of the Walbridge-Aldinger Company, general contractors, of Detroit. Another paper, having reference to the short courses of instruction recently inaugurated by the Institute, is entitled "How Water-Cement Ratio Courses Widen the Market for Reinforcing Steel." This paper will be presented by R. W. Johnson, engineer for the Institute. Still another period has been set aside for the discussion of the Trade Practice Conference rules recently established by the Institute in cooperation with the Federal Trade Commission. A fourth paper comprises a report of the Concrete Forms Department of the Institute, on the subject of concrete joist construction.

Northwest Products Men Hold Meeting at Seattle

The Northwest Concrete Products Association held its fifth annual meeting at Seattle, Washington, on January 24th and 25th. Speakers on the program included Dr. H. J. Benson, dean of chemistry, University of Washington; C. W. Kief, Portland Cement Association engineer, E. G. S. Pryor, resident engineer, Underwriters Laboratories; W. H. Sharp, president, Longview Concrete Pipe Co., E. W. G. Clark, president, Vancouver Pipe Company, Bailey Tremper, engineer of tests, Washington state highway department; Prof. Ira L. Collier, University of Washington; and W. D. Barkhuff, city engineer of Seattle.

Bellingham, Washington, was selected as the July meeting place.

Cast Stone Institute Makes 1930 Plans

New Orleans Gathering Shows Worth of Organization—Advertising Program to Continue—Research Program Being Considered—To Solicit New Members Among Responsible Manufacturers

THE second annual meeting of the Cast Stone Institute was held at New Orleans on February 11 and 12, 1930, during the time the American Concrete Institute was holding its annual meeting in the same city. A keen interest in the affairs of the Institute was displayed by all those present and considerable pleasure and profit was derived from the personal contacts of members.

The following officers were elected for the ensuing year: C. Van de Bogart, president; Wm. Paul Eddy, Herman Frauenfelder, vice-presidents; L. A. Falco, secretary; O. L. Formigli, treasurer.

President's Report

The president made a very comprehensive report covering a brief history of the organization and its accomplishments during its two years of existence. He called attention to some of the vital aspects of trade association activities and invited all responsible cast stone manufacturers to join in the work of the Institute.

The Institute's Value to Members

A dinner meeting on Wednesday evening afforded an opportunity for cast stone manufacturers to get better acquainted. In opening the business session following the dinner the president briefly reviewed his report of the preceding evening, and concluded his remarks with the following comment which very aptly sums up the situation: "The one outstanding accomplishment of the Cast Stone Institute is that it has served as a vehicle of discovery—a means of bringing to cast stone manufacturers, through personal contacts and discussions, information and ideas which were new to them."

At the request of the president, W. D. M. Allan addressed the meeting. He commended the loyalty and faithful support on the part of members, pointed out the psychological effect which by virtue of its existence the Institute has upon producers and users of cast stone, called attention to the activities of competitive materials, and stressed the need for improvement in merchandising methods.

Advertising and Research

Brief discussions on the effect of national advertising, the importance of careful planning and adequate budgeting of expenditures, and the pressing need for research were given by members of the Institute. A rather comprehensive research program was presented to the meeting and a committee appointed to carry it out in so far as funds are available.

Memberships Invited

The Cast Stone Institute has now come to a point where it is able to solicit new memberships on the strength of its accomplishments, and plans are being laid to induce an additional number of responsible manufacturers to become members.

How Local Aggregates Influence Concrete

By A. C. BLACKALL

In the preparation of an estimate for reinforced concrete work the bid is very frequently based on the assumption that suitable aggregate will be obtainable locally and therefore cheaply. It is in practice only rarely that samples of the proposed aggregates are submitted to the engineer for approval before the contract is let. In some districts it is very difficult to obtain a good hard stone or gravel. The contractor makes his choice of what he considers the most suitable from that available, but it is quite possible that in the opinion of the engineer it is not satisfactory. Should the latter insist on the use of a better material, at a greater cost to the contractor, so long as he has safeguarded himself in the first instance by a correctly framed tender? This will involve the interests of the client, and he will naturally inquire whether this extra payment is really necessary. Without some definite figures to go upon, personal opinion can be the only arbiter, and when financial interests clash this is scarcely sufficient.

In an interesting lecture recently delivered before the Yorkshire Branch of the Institution of Structural Engineers, G. Ness discussed the results of an investigation carried out jointly with J. E. Worsdale, the object of which was to ascertain the influence of quality of aggregate on the quality of the concrete in which it was incorporated. The work was not confined to laboratory tests alone, but test cubes made on the construction site were also used. Concretes containing aggregates previously condemned by engineers were compared with concretes using what had been pronounced to be satisfactory aggregates, both coarse and fine.

In the result the author came to the following conclusions with respect to local aggregates: (1) While good hard aggregates give better crushing strengths to concrete than softer ones, for ordinary working stresses poor aggregates seem good enough; (2) most coarse aggregates, since they shear before the final crushing strength of the matrix is reached, cannot contribute very largely to the strength of the concrete as a whole; (3) more attention should be given to the quality of the matrix than to the quality of the coarse aggregate. The fine aggregate—more generally, though less satisfactorily, called sand—should be well graded, of good quality, and free from detrimental impurities, especially organic matter, likely to affect the setting properties of the cement; (4) it is suggested that results of laboratory tests of strength when reduced by about one-third may be taken on the average to approximate construction site values; (5) concretes made with lower quality aggregates are perfectly satisfactory for use under less exacting working conditions.

Fifth Annual Meeting of National Concrete Products Association

Hold One-Day Session at Roosevelt Hotel, New Orleans, Preceding Annual Meeting of American Concrete Institute—Concrete Products Also on Institute Program for One Afternoon Session—May Establish Fellowship

THE fifth annual meeting of the National Concrete Products Association was held at the Roosevelt Hotel in New Orleans on February 10th, one day prior to the opening of the American Concrete Institute convention.

Light-Weight Aggregate

The morning session included an illustrated paper on the subject of "Light-weight Aggregates," by Dan F. Servey, secretary of the Haydite Manufacturers' Association, Kansas City. The paper set forth the advantages of light-weight aggregates, and showed lantern slides of a number of instances where these materials have been employed.

Co-operative Selling

The afternoon session included a talk by D. R. Collins, manager of the Milwaukee Concrete Products Co-Operative Association, who described the co-operative selling organization formed by that association for the purpose of eliminating wasteful sales efforts and checking up the credit standing of prospective purchasers, and the methods employed in making collections. The co-operative organization was organized in July, 1929, with 21 members. On January 1, 1930, the past-due accounts of the 21 members of the association were only one-tenth of the total of the similar accounts on the books of the 21 individual members at the time the association was organized.

Possibility of Fellowship at the Bureau of Standards

A considerable part of the afternoon session was taken up with a round-table discussion, which followed a talk by W. D. M. Allan on the "Past and Future" of the National Concrete Products Association. Mr. Allan and a number of other speakers discussed the importance of taking aggressive action toward the gathering of definite scientific data on the performance of hollow concrete units. Various speakers urged the establishment of a fellowship at the United States Bureau of Standards to carry on an investigation of the kind already undertaken by other associations representing manufacturers of other kinds of masonry units. As a result of this extended discussion, a committee was appointed to consider the question from all angles, including the possibility of raising a fund to cover the necessary expense of a fellowship.

Industry Represented on Institute Program

One entire afternoon session of the American Concrete Institute was devoted to the concrete products industry, and a report of that session is printed elsewhere in this issue. The subjects covered included a study of shrinkage of concrete masonry walls, recommended practice for the manufacture of standard concrete units, recommended practice for the use of cast stone, color in concrete products, and plant design for single-shift or multiple-shift operation.

Election of Officers

The business session resulted in the election of D. R. Collins, manager of the Milwaukee Concrete Products Co-Operative Association, as president; Austin Crabbs, of the Cement Products Company, of Davenport, Iowa, was elected vice-president; and Jack Franklin, 425 East Water Street, Milwaukee, Wis., was elected secretary-treasurer.

Ply-wood for Concrete Forms Proves Successful on Pacific Coast

Rough ply-wood as material for the construction of concrete forms is being used successfully and economically by the Elliott Construction Company of Aberdeen, Washington. Veneer panel was first substituted for the usual shiplap lumber experimentally in the erection of the Dudley-Carbery Building at Aberdeen last fall. The results were so gratifying that the company has continued to use it on practically all concrete jobs. For this purpose, $5/8$ in. 5-ply rough veneer has been found most suitable.

An almost perfectly smooth surface of concrete can be obtained through the use of this material, because the ply-wood does not shrink and the leakage of cement is eliminated. The cost of placing and stripping is considerably less than for the lumber usually employed, and there is practically no waste.

A further advantage of ply-wood for this purpose is its durability. Some of the form panels used in the initial experiment in October, 1929, were used a number of times on other work and were still in use on other jobs in February, 1930, although they had no special attention aside from being dipped in shingle oil when delivered.

Mixing Proportions for Concrete Tile

A fairly average mixture for concrete tile is one part of cement to three parts of combined fine and coarse aggregates, graded up to the maximum size permissible for the size of tile being made. For illustration, the maximum size of aggregate should be about $3/8$-in. for a 6-in. tile, $1/2$-in. for a 12-in. tile, and $3/4$-in. for a 24-in. tile.

Such a mixture of aggregates should be well graded from the finer sizes to the coarser. The most suitable proportions between fine and coarse aggregate, as well as the proportions between cement and combined aggregate, should be determined in the last analysis, however, by trial mixtures of the material available. The same is true of the quantity of mixing water, which will be dependent largely on the requirements of the equipment used, and can be determined only by trial mixtures.

Reinforced Concrete Work 25 Years Ago

Good Quality of Concrete in Spite of Limited Knowledge About Material—An Early Type of Mixer—Handling Concrete

By L. KOPCZYNSKI
Architectural and Industrial Engineer, Boston, Mass.

REINFORCED concrete construction work designed and built in the period from 1900 to 1907 should be of both practical and scientific interest at this time, because of its value in estimating the behavior of concrete structures over a long period of years.

During that period our design and construction practice was of necessity based largely on European practice, though but little information regarding that practice was available in published form. Whereas, American engineers have always been inclined to give their experiences to the profession, European engineers are more inclined to keep their engineering data as their personal stock-in-trade.

It was my good fortune, however, to get acquainted with Henri Kempman, Eng., a Baltimore representative of the Hennebique firm of Paris, who were the first to introduce the skeleton type of reinforced concrete construction in the United States. Through the good office of Mr. Kempman I learned the underlying principles of reinforced concrete, the new material. I saw the possibilities of such construction and studied the various methods of calculation, especially those compiled by Dr. Eng. von Emperger, of Vienna, who later visited this country and was very helpful in popularizing reinforced concrete on this side of the Atlantic.

While authentic information on reinforced concrete design and construction at that time was very meager, the theory and practice were rapidly extended and soon approached the scientific basis of the present day.

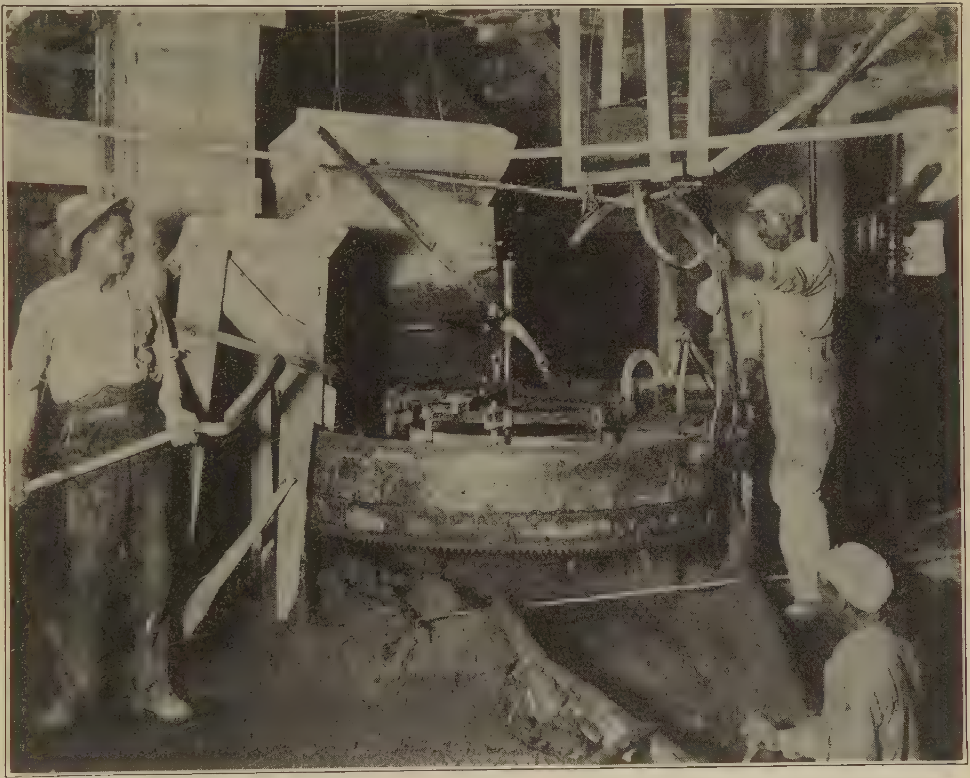


Fig. 1. Is this the first concrete mixing machine? It was manufactured in Duluth and is here shown in service at the 8-story Maryland Hotel in Baltimore, built in 1903-1904. Note the two measuring boxes for sand and for crushed stone, and the automatic adjustable tank for water

Early Concrete Mix

In the early period of the use of concrete it was the custom to use a dry mixture and to tamp a freshly placed concrete to a quaking consistency. This was not practicable for reinforced concrete work, because the dry mixtures could not be properly placed around the steel reinforcement. Consequently, after some study and observation I decided in 1902 to make the concrete of a semi-slushy consistency, which I practice today. The photograph designated as Figure 1, illustrating the first one-bag concrete mixer I used, shows that there were three measuring boxes, one for crushed stone, one for sand and one automatic adjustable tank for water. I made it my business as engineer and contractor to watch the water supply very closely, so that the concrete would be of uniform quaky consistency. Spading at the forms was all that was necessary to produce a dense mass of concrete.

The 8-story Maryland Hotel in Baltimore was built during 1904 on a concrete foundation, resting on a hard mixture of clay and sand, for which we assumed a carrying capacity of 5 tons per square foot. The concrete in the foundation was a 1:2½:5 mixture, except the top section, which was 1:2:4. All the super-structure concrete was 1:2:4, with the exception of three columns, for which the mixture was 1:1½:3. At the beginning I had some difficulty with the form work, as our carpenters and carpenter foremen were not experienced in following the detailed drawings. The Baltimore fire, however, attracted carpenters from the whole world, and I was fortunate enough to get a few French and Greek carpenters who had some experience in Europe. Soon I had a dozen selected American carpenters, with competent foremen, who did the work safely and economically. The photograph of the Maryland Hotel under construction, designated as Figure 2, shows that the methods of form construction were much as they are today. The main purpose was not only to erect form work strong enough to hold the concrete, but to construct it so that it was easy to strip the finished work without much loss of lumber. This is the practice today.

A few years ago I inspected the Maryland Hotel from basement to roof, and could not find any cracks. All the ceiling was plastered direct on the concrete, except the large dining room, which was furred and lathed. In this building is the first example of stair and elevator shafts built of 4-in. walls of reinforced concrete, and built in spite of the objections of bricklayers.

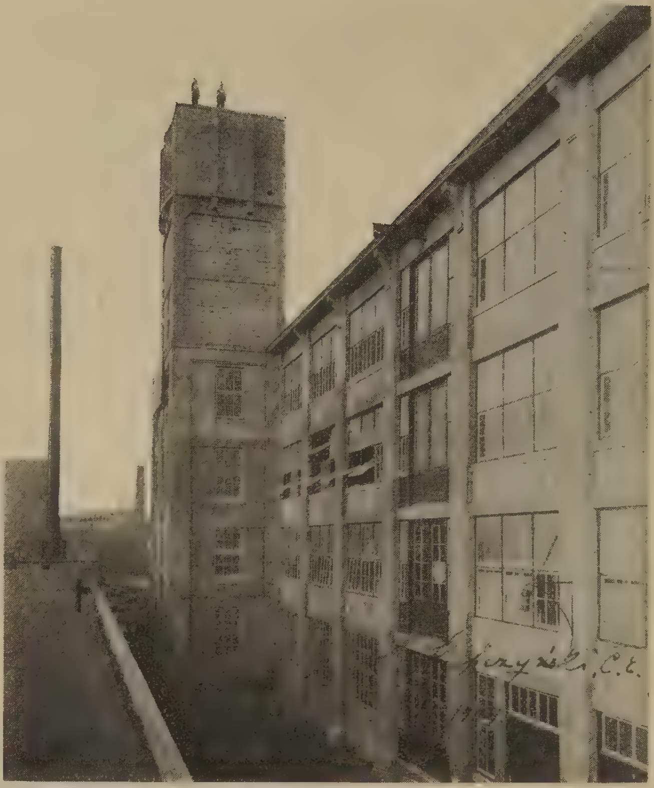


Fig. 3. Reinforced concrete factory building built in 1907 *for F. P. Pfleghar & Co., New Haven, Conn. Note the square concrete tank on top of the tower. The concrete block exterior panel walls were waterproofed on the outside*

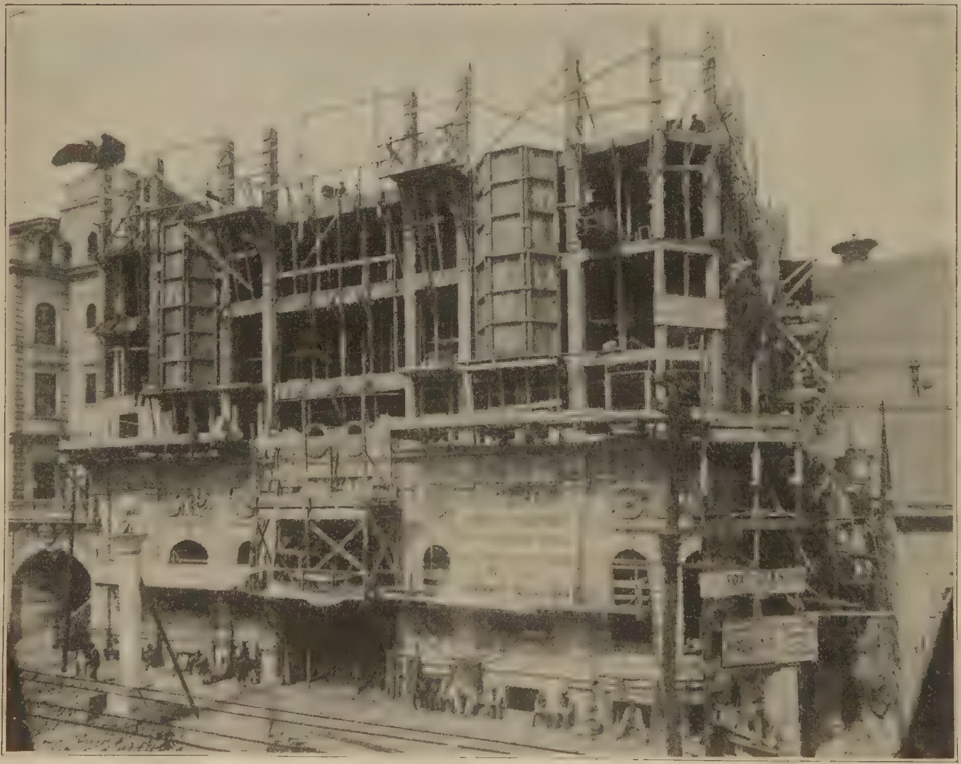


Fig. 2. *Maryland Hotel, an* 8*-story reinforced concrete structure built in Baltimore in* 1903-1904. *Note the similarity between the form work of that time and the practice of today*

The building shown in Figure 3 was built in 1907 for F. P. Pfleghar & Company, now the English & Mersick Company of New Haven, Connecticut. It is in splendid condition today, regardless of the rough usage to which the building has been subjected. The 20,000-gallon concrete tank, which stands upon reinforced concrete columns

87 feet above ground, gave us some trouble in later years, and taught me that while a reinforced concrete water tank is economical, it should be housed in to protect it from frost. It is probable, too, that we were somewhat ahead of our time in attempting the construction of a concrete water tank at that time. This square tank is still in use, but must be repainted with waterproofing at intervals of about 3 years.

Other parts of the New Haven factory building are, to my knowledge, in very good condition. The exterior panel walls of concrete block showed some tendency at first to permit leakage of rain when accompanied by high winds, but that trouble was overcome by waterproofing the outer surface. The concrete mixture for the water tank was 1:2:4, with hydrated lime added to the mixture to the amount of about 6 per cent of the weight of the cement.

Methods of Handling Concrete

In regard to my methods of handling material at the various jobs, I studied every job with respect to its special requirements. At the Maryland Hotel the concrete was conveyed to the forms by buggies and hoisted on a platform elevator holding buggies. At the American Baseball grandstand, a structure about 650 ft. long, the concrete was hoisted in a bucket and spouted on an incline of 25 to 35 degrees. All these methods represented progress over the first methods of hand-wheeling the concrete on inclined runways.

I may mention that although we have progressed rapidly in our knowledge of reinforced concrete and now have elaborate laboratory data at hand, the fact remains that inspection of buildings is not what it ought to be. I have never had a collapse or even a partial failure on a reinforced concrete structure designed and built under my supervision, and I am convinced that the failures that have occurred can be traced to lack of competent inspection coupled with lack of experience on the part of the contractor.

Many large construction companies who employ trained men have built up enviable reputations because of the excellent quality of the concrete work built by them. The architect has little to worry about with them; but the contractor who does not fully understand his problem should be given careful supervision until the quality of his work is up to the present-day standards of construction.

An Exposed Aggregate Drive

Construction Methods Used to Build a Driveway in Which Color Was Secured by Exposing Selected Aggregates and Adding Pigment to the Mortar

By ALB. L. BITTER
Supt. of Construction, The Menke Stone and Lime Company, Quincy, Illinois

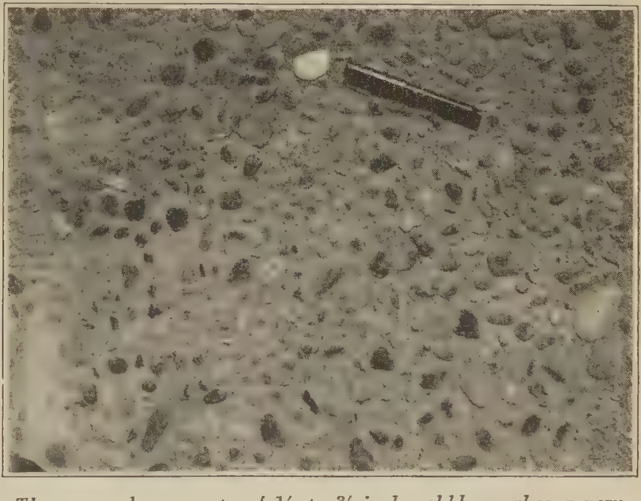
THE Royal W. Jackson home, on our principal residential street, is one of the finest in Quincy. In the spring of 1929 Mr. Jackson decided to put in a driveway and the Menke Stone and Lime Company contracted to do the work. The driveway was to be colored to fit in with the color scheme of the house and, in addition, was to have an exposed aggregate surface. Because of these two special features a description of the construction work may be of interest.

The location for the driveway was planned by a Chicago landscape architect who came to Quincy especially for that purpose. There is one entrance branching into a 9-foot drive running to the garage, in the rear of the house, and a loop which runs to a parking space and under the porte cochere. Except at the flared portion, the entrance part of the driveway is 17 feet wide. The parking space which is of the same construction as the drive is 27 feet wide by 90 feet long and can be illuminated by a floodlight concealed in a tree.

Concrete Proportions

The concrete is 6 inches thick and is composed of a bottom course 4 inches thick for which the concrete was proportioned 1:2:3 and a 2-inch top course of 1:1:3 concrete. The color is in the top course only and this top course contains an excess of coarse aggregate to make the exposed aggregate surface possible. Wire mesh reinforcement weighing 42 pounds per hundred square feet was put in between the top and bottom courses. Expansion joints half an inch wide were installed at 33-foot intervals and the two ends of the slab were joined by steel dowel bars spaced 3 feet center to center. The portion of the dowel in one slab was provided with a sleeve which allowed the bar to slide back and forth in the concrete, as the joint opened and closed, and also provided an expansion space at the end of the dowel.

On curves the slab was tipped toward the inside of the curve so that it sloped 2 inches in 10 feet. The slope along the driveway was also 2 inches in 10 feet, which is



The exposed aggregate of ½ to ¾-inch pebbles makes a very pleasing surface. Some larger pebbles were also hand-picked for color and size the flattest grade on which an exposed aggregate slab will drain properly, though 1 inch in 10 feet is sufficient for plain concrete drives.

Color Placed in Top Course

The color was put in the top 2 inches only. It is a red, purchased from the G. D. Smith Chemical Works at Springfield, Illinois, who recommended that 8 pounds be used for each sack of cement. After experimenting with that amount of color, however, we decided that the shade we wanted would be secured with 6 pounds of color per sack, and that was the amount used. The color cost 14 cents per pound.

The entrance, which is 17 feet wide, branches two ways, one 9-foot branch going to the garage and another forming a loop running to the parking space and the porte cochere

The concrete was mixed in a batch mixer and was kept pretty dry, so that no excess water would come to the top, carrying with it color which would mottle the surface. After concrete for the top course was deposited it was struck off, and floated with a wood float. Then Mississippi River gravel ranging in size from ½ to ¾-inch was put in the mixer, without mortar, and the drum was turned a few times to coat the pebbles with color. These coated pebbles were then cast on the slab and tamped into the surface with a 2 by 6 plank which had a 2 by 4 rib on its upper face, as a stiffener, and plow handles at each end. In addition to the ½ to ¾-inch pebbles which were secured by screening, larger pebbles of the desired color were selected by hand. Unless pebbles were cast on the surface there was not enough coarse aggregate at the top to give the desired exposed aggregate finish.

Exposing Surface Aggregates

From 2½ to 5 hours after the concrete was laid the surface aggregate was exposed by brushing out the mortar with ordinary house brooms. Brooms with heavier bristles were tried at first, but had to be discarded because they loosened the coarse aggregate. Water was run on the concrete as it was brushed, to carry away the loosened material and clean the surface of the stones. It took four men about 2½ hours to brush 500 square feet of surface. An acid wash was tried for the same purpose but was not successful.

No water was put on the pavement except that used in removing the mortar. As soon as this operation was completed the driveway was covered with Sisalkraft paper, which kept the slab from drying out too rapidly. It also kept the sun from the color until the concrete had hardened, which is of considerable importance.

The driveway has been pronounced not only the best in the city, but "the best they have ever seen" by everyone who is interested in driveways. Rains seem to bring out the value of the color, which is even better today than when the driveway was first laid. And the exposed aggregate makes a very pleasing surface.

Ohio and Michigan Have Pavement Schools; West Virginia Design Courses

Ohio and Michigan concrete pavement contractors will have an opportunity to learn and discuss the best practices of the day in a series of schools to be held during March. These schools will deal with the design and construction of concrete pavements and will be conducted by a Portland Cement Association representative. They are as follows:

Ohio Schools

March 3 and 4, 7:30 p. m., Youngstown, Rm. 112, Rayen High School, 20 Wood Street.

March 5 and 6, 7:30 p. m., Akron, Municipal University.

March 7 and 10, 7:30 p. m., Cleveland, Parlor C, Hollenden Hotel.

March 11 and 12, 7:30 p. m., Mansfield, Senior High School, W. Park Drive.

March 13 and 14, 7:30 p. m., Toledo, Cherry Street Bldg., Toledo University.

Michigan Schools

March 17 and 18, 7:00 p. m., Monroe, Mich., Washington Street School.

March 24 and 25, 7:30 p. m., Detroit, Detroit Engineering Society Rooms, 478 W. Alexandrine.

March 27 and 28, 7:30 p. m., Birmingham, Village Hall.

March 31 and April 1, 7:30 p. m., Pontiac, Stevens Hall.

Two short courses in design and control of concrete mixtures will be given in West Virginia in March also, as follows:

March 12, 13, 14, Huntington, W. Va.

March 17, 18, 19, Bluefield, W. Va.

$28,000,000 for 1930 Louisiana Road Construction

With approximately 100 miles of concrete highways completed, and 400 miles more under contract, the Louisiana State Highway Commission is well under way toward giving the state a complete system of approximately 3,000 miles of concrete roads by the end of 1932. The system, when completed, will reach nearly every parish government seat, as well as all other important towns and cities. O. K. Allen is chairman of the highway commission.

Small Increase in Fire Losses

The fire losses in the United States and Canada, as represented by actual fire insurance adjustments reported, amounted to $332,426,600, according to figures compiled by the "New York Journal of Commerce." This is an increase of $31,159,040 over 1928 and $11,831,000 over 1927. The 1929 loss is less than that reported from 1921 to 1926, inclusive. It is estimated that the figures reported are about 75 per cent of the total fire insurance adjustments.

Wisconsin Products Association Eighth Annual Meeting Has Record Attendance

Short Talks on Selling—Co-operative Advertising—Selling Concrete Products for Large Buildings—A Code of Ethics for the Industry?

THE eighth annual meeting of the Wisconsin Concrete Products Association, held at the Plankinton Hotel, in Milwaukee, on January 29th and 30th, was without question one of the most successful meetings ever experienced by the concrete products industry. With nearly 200 registrants, including concrete block manufacturers from eight or ten other states, and with a number of interesting talks and papers on the program, the meeting was, in every sense of the term, an annual convention of an industry.

Address of President Collins

The opening session on the morning of January 29th was taken up by the address of the president, D. R. Collins, followed by a series of short talks on the subject, "My Outstanding Job and How I Landed It," by several well-known members of the association. Mr. Collins emphasized a number of important points in his address. "Most of us," he said, "have little time to travel around the country during the business year, to visit with our fellow manufacturers and learn what they are doing and how business as a whole is progressing. But these things will be brought to our very doorsteps if we will cultivate the habit of reading. A knowledge of the happenings and developments within every trade and profession is so important that there have been created trade papers which are of paramount importance to their respective industries. These papers primarily supply the business man with a correct knowledge of new engineering and manufacturing methods, with information on sources of material supply, marketing conditions, sales and merchandising methods and plant management. The technical data and merchandising helps that our trade magazines give are essential to the life of our industry.

"Consider the vast changes that have taken place in our own industry in the past few years, quality production, change and color in design, a new condition of competition, the importance of facts revealed by research. Everywhere are new forces touching the conduct of our business. So complex are these changes and so swiftly do they come that today it is a fundamental of business management to have a knowledge of the news and an ability to interpret it in the language of the concrete products business."

Short Talks on Selling

In the short talks that followed, on the subject of "My Outstanding Job and How I Landed It," a number of personal experiences were related concerning the methods employed in selling concrete masonry units for structures that are out of the ordinary in size and importance. For instance, there was the Milwaukee church building on which the cast stone was sold by a manufacturer of Oshkosh. A Racine block manufacturer sold the light-weight block in the partitions and for back-up in the outside walls of a church in Kenosha. The paper on the Kenosha church, presented by Julius Sorenson of Julius Sorenson & Sons, Racine, Wisconsin, was of exceptional interest.

Co-operative Advertising

Next on the program was a talk by R. J. Fisher, field engineer for the Wisconsin Concrete Products Association, on the subject of "Co-operative Advertising."

"Co-operative advertising is the most potent weapon in meeting competition as it exists today," Mr. Fisher said. "Too many members of trade associations feel that, through the beneficence of this mysterious magic of co-operative advertising, all they have to do is listen to the ringing of the cash register. Too many think that association advertising is a cheap substitute for individual advertising.

"Few realize that co-operative advertising is much newer than individual advertising and that it still has many unsolved problems which require not only expert management, but also the active and intelligent support of every member. At least it demands the member's self-interest in tying up his advertising and merchandising efforts to the co-operative work of the association."

Mr. Fisher then showed motion pictures of the Home-Show house which will be given away at the Milwaukee home exposition in March, and explained that this piece of co-operative advertising on the part of the manufacturers of many allied trades could be used as a fitting subject for the individual advertising of the various members of trade associations contributing to this home.

Selling Concrete Products for Large Buildings

The average concrete products manufacturer is not in the habit of selling his materials on buildings which utilize from 200,000 to 600,000 units. Nevertheless, in an illustrated talk that held the undivided attention of the audience, W. D. M. Allan, manager of the Cement Products Bureau of the Portland Cement Association, told of ten important buildings of this kind. He related the details of the methods employed from start to finish in selling concrete units for each of these ten buildings, the largest of which was a hotel in Atlantic City in which 600,000 hollow concrete tile were used. He mentioned another building in which more blocks will be used than were made annually by the largest plant in the country ten years ago. One manufacturer, Mr. Allan said, recently delivered 34,000 blocks to a building in one day. That was more than the average plant produced in a year in 1920.

Underwriters' Inspection Service

Mr. Allan also discussed the Underwriter's Inspection Service. "This inspection service," he said, "is one of the reasons why concrete masonry, defined as block or tile building units molded from concrete and laid by masons in a wall, has increased in use as fireproofing for structural frames, partitions or fire walls, elevator shafts, enclosed fire-escapes, floor fillers and back-up for other masonry materials in big building construction. Leading producers are using this service, which brands their products as approved by the Underwriters' Laboratories, resulting in production of high quality products."

A Code of Ethics for the Industry?

At the close of his talk, Mr. Allan discussed the possibilities of having the concrete products industry establish a code of ethics covering rules of fair practice, in co-operation with the Federal Trade Commission. The delegates seemed deeply interested in this subject, and a committee was appointed to study the question and make recommendations at a later meeting.

Specializing in Foundation Work

The morning session of January 30th was addressed by Charles Van Houten, a products manufacturer and concrete contractor of Chicago. Mr. Van Houten has had many years' experience in this work, and his talk drew out a considerable amount of discussion. He told of the methods his organization employs in developing business, more especially in connection with building concrete basements and foundations under existing buildings. His address was much along the line of an article published on pages 17 and 18 of the October, 1929, issue of CONCRETE, in which the selling methods of the Van Houten organization were described in detail.

Putting Responsibility in Its Place

In a paper by Oscar T. Nelson, assistant building engineer for the Industrial Commission of Wisconsin, the speaker discussed the responsibility of the concrete products manufacturer in his dealings with the building inspector, and the importance of supporting the building inspection department in the effort to insure a good quality of material and workmanship.

"As to the Wisconsin Industrial Commission," Mr. Nelson said, "the responsibilities of the commission and of the concrete products manufacturer are practically equal. The responsibility of the Industrial Commission is a legal one and that of the products manufacturer is an ethical one. Assuming responsibility by the commission alone will place a decided hardship on the manufacturers. Full benefit of the enforcement of orders applying to concrete products can be secured by the manufacturers only if they assume their own responsibility in full."

City Building Inspection

Mr. Nelson was followed by Leon M. Gurda, building inspector for the city of Milwaukee. Mr. Gurda, after telling of the progress now being made on the revision of the Milwaukee building code, and of the co-operation he has obtained from concrete products manufacturers in the development of regulations governing that industry, told of some of the difficulties his department has encountered in the enforcement of the present code.

"An efficient and well organized bureau of inspection," Mr. Gurda said, "can do much in bringing about an orderly development of a city; yet to attain complete success in the enforcement of the building regulations it must have the co-operation of all parties engaged in the building industries. I shall not discuss at length the question of co-operation with the building inspection bureau, by those engaged in construction work, but merely wish to state that the degree of success a bureau of inspection can attain depends in a large measure upon the extent to which it receives this co-operation. Without this co-operation we have manifold difficulties to overcome."

Concrete Products Plant Design

A paper on the subject of "Five Practical Plant Plans," was presented by Gene Olsen, representative of the Consolidated Concrete Machinery Corporation. Mr. Olsen distributed drawings and details of several plant layouts and announced that additional copies could be obtained from his organization.

Selling Your Product to Your Employees

"What Your Product Should Mean to Your Men" was the subject of a talk by George W. Porter, of the Universal Atlas Portland Cement Company, at the afternoon session of January 30th. Mr. Porter stressed the importance of having employees of concrete products plants thoroughly familiar with both the manufacture and the use of the material they are making. "My theory," he explained, "is that a plant which might otherwise operate at a loss may turn this to a profit by obtaining the co-operation of its employees. Many public utility companies, by the method of selling stock to consumer-customers have made these people boosters for the company instead of knockers. If the concrete products manufacturer will sell his employees, they in turn can do a great deal toward influencing public opinion toward the product of that manufacturer."

Co-operative Association

One of the outstanding points of interest in this convention were the talks and discussions of the work of the co-operative sales organization formed in July of last year under the name of the Milwaukee Concrete Products Co-operative Association. This association has a representation of 21 members. The work of the association was discussed in detail by the manager, D. R. Collins, and by F. W. Zilisch, sales manager.

"By centralizing the credit information of twenty-one concrete products factories," Mr. Zilisch said, "we have been able to eliminate many poor credit risks. This has been of great assistance to the responsible contractor.

"The association idea is advancing. Selfish competition is fast becoming absent from our ranks and in its place is being generated a whole-hearted spirit of co-operation.

"We are, at this time, making an extensive canvass in Milwaukee to promote the underpinning and modernization of old homes. In doing this we feel that we are creating new business, not only for our contractor customers but in all allied lines. A surprising amount of this sort of work can be found in Milwaukee, and a large amount of business can be found if intelligent methods are used in going after it."

Full details of the Milwaukee co-operative plan were discussed by Mr. Collins in the November (1929), December (1929) and January (1930) issues of CONCRETE, beginning on page 17 in the November and December issues and on page 21 in the January issue. "The achievements of our association," Mr. Collins said, "have been obscured by the trying conditions of finance and business. No one can successfully judge the future by what has taken place the past six months. High interest rates, curtailing of loans by building and loans and by banks, a consequent decline in residential construction, have all contributed to a slump in our business.

"But in spite of this temporary set-back our association is making bigger strides each day. The former selfish rivalry, brought about by competition, is now absent. Everyone has shown a willingness to co-operate."

Colman Discusses Concrete Products Industry

An exceptionally attractive feature of the convention was the last event on the program, consisting of a talk on the present business situation in the concrete products industry by Harry J. Colman, a consulting business analyst of Chicago.

Loss to Products Manufacturers

"It is estimated," said Mr. Colman, "that the concrete products manufacturers of this country have lost millions of dollars of profit because they tried to apply a false, untrue and pernicious theory of merchandising that has been preached by unthinking and uninformed cost accountants and so-called business experts who are not versed with the underlying basic principles and fundamentals upon which a business dealing in staple building materials is conducted. They preach the doctrine that a dealer can afford to reduce his gross margin in order to stimulate increased volume, and that because of these increased sales he will earn additional profit because of a quicker turnover of capital and merchandise.

Experiences in Other Fields

"I have had the opportunity of studying the confidential operations of more than a thousand retail lumber, mason material and coal concerns during the last six years, and want to make the unqualified statement that not in one single instance have I ever found that this theory worked out successfully in practice. My experience is that in every instance where an increase of volume was secured it was accompanied by a corresponding increase of expenses.

Omit "Bargains"

"When prices were cut to achieve the sales increase we found that the dealers actually lost money because they were unable to gain an additional volume sufficient to offset the lost margin of profit that they voluntarily sacrificed in trying to work out this low price, quick turnover idea.

"The plan is fundamentally wrong for application to a business like yours. Successful building material merchants will acknowledge that they earn their profit because they ask and get a fair price for their products. No manufacturer or dealer in building materials ever achieved his success because of high inventory turnover. Why some building material men persist in trying to do the impossible and continue to lose profits for themselves and their competitors by ruining the local market is difficult to explain, unless by applying Pope's philosophy that 'a little earning is a dangerous thing.'

Obtain Proper Selling Price

"Profit must be made from obtaining the proper selling price when you are merchandising staple articles where your competitor can furnish practically the same kind and quality of material. Theories that might be applicable to certain retail lines which permit the appeal to fancy, styles, colors or fads, cannot be used successfully in selling a building material such as concrete products. The cut in the price of cigars and cigarettes will increase their sale and consumption; but if a man needs 500 blocks to build a garage he won't buy 600 blocks because the price is cut. Department stores have real bargain sales which attract lady customers to their stores. These customers may and do buy other merchandise that they never would have bought had they not been attracted to the store by the bargain advertisements. No one ever heard of women being attracted to a coal or lumber yard by a bargain sale and then buying cement or plaster for which they had no use."

January Construction Reports Are Encouraging

The outstanding point of interest in January construction reports is the large volume of contemplated construction, all previous monthly records having been exceeded in this respect. Contracts awarded show a small but gratifying increase over December.

Building Permits Increase in 25 Largest Cities

The value of building permits issued in the 25 largest cities of the United States increased over the December values by $7,105,733, according to reports prepared by S. W. Straus & Co. The values, however, are only 54 per cent of permits issued in January, 1929. In 566 cities of the United States, including the 25 cities just mentioned, there was a decline of 17 per cent as compared with the previous month. The comparative figures are:

	Building Permit Values in Cities of U. S.	
	January, 1930	December, 1929
25 largest cities	$ 85,895,394	$ 78,789,661
All cities (566)	127,685,004	153,717,819

Big Increase in Contemplated Construction

An enormous increase in contemplated construction in the 37 states east of the Rocky Mountains, as compared with a year ago and with the previous month, is shown in the construction reports for January, issued by the F. W. Dodge Corporation. The comparative figures on contemplated construction follow:

	Contemplated Construction
In January, 1930	$1,455,349,600
In December, 1929	864,230,600
In January, 1929	818,284,000

The contemplated construction in January, 1930, is made up of $647,138,200 for buildings and $808,211,400 for public works and public utilities construction programs.

Contracts Awarded Larger Than in December

	Value of Contracts Awarded	
	Jan., 1930	Dec., 1929
Buildings	$211,910,000	$264,546,800
Public works and public utilities	112,065,200	51,821,300
Totals	$323,975,200	$316,368,100

The figures just quoted are exceptionally gratifying because of the increase of more than 100 per cent in contracts for public works and public utilities construction.

Contracts awarded for concrete pavements in January were less than in the same month of 1929, according to reports received by the Portland Cement Association. The separate figures for roads, streets and alleys follow:

	Sq. Yds. Awarded in January	
	1929	1930
Roads	6,088,674	5,244,263
Streets	1,308,682	1,306,797
Alleys	63,810	43,517
Totals	7,461,166	6,594,577

Reduced yardage in awards for concrete roads accounts for the greater part of the reduction. It is believed that the severe weather and heavy snows throughout the Mississippi Valley and the East during January were largely responsible for the failure to equal the record of January, 1929.

From the Products Associations' Bulletins

Iowa Concrete Products Association

R. L. GAVIN, Secretary-Treasurer

"WHAT Is Your Conception of Business?" asks the February issue of the "Concrete Products News."

It continues, "There is something more to business these days than making goods and selling them at a profit. Men answer the call of commerce, not just to make money, but to help all mankind.

"The development of that scientific civilization which has been remaking world standards during the past three generations has been a commercial conquest.

"Business men, in less than a hundred years, have done more for individual health, happiness and comfort than all the politicians, orators and soldiers have been able to do since the very dawn of evolution.

"We live better, dress better, eat better and feel better, not because some munificent dictator has shared his spoils with us but because some 'hard-headed' business man has thought out a better way of doing some one of the ordinary chores of life."

Moralizing somewhat, an item under the title, "The Man Whom the Years Forgot" states:

"He ran a successful business twenty years. He had built up this business by hard personal effort. Those who dealt with him knew that he could be relied upon, and anything he sold was well worth the money.

"And he had a fine group of customers.

"But customers change. Some of them die. Some go away. Some get restless and turn to competitors.

"So it was with his customers. And not enough new ones came to take their place.

"This man worked harder. He studied his products. He kept them up to date. In many ways he was the best posted man in his line of business.

"Except one thing—and on that one thing his competitors had passed him.

"He did not keep in touch with old customers and attract new ones with sufficient energy.

"He believed the old 'mouse trap' saying, that people would beat a path to his door.

"But competitors set up along the beaten path, and the customers were diverted.

"He forgot to study the progress made in merchandising. He failed to see or find out the methods used by others in his same line of business, who were continually in communication with his customers, telling them the advantages of other merchandise, building confidence in other business institutions, winning away the people who made this business successful twenty years ago.

"This is not the story of any one business. It is the story of a score of businesses, once successful, but today disappeared or disappearing from the field."

A few paragraphs under "Good Will" state:

"The Supreme Court said: 'Good-will is the disposition of the customer to return to the place where he has been well served.

" 'The disposition can be so fixed that it becomes a habit.

" 'It is not my custom to keep cigars in my desk, but once or twice a year someone hands me a box. I have observed that twenty-five will last three or four months, simply because I am accustomed to buying cigars in small quantities at the cigar stand in the office building. When I start for lunch, I am at the stand before I recall that I have cigars in my office. If I went into the business myself it would probably take me some time to remember to patronize myself.

" 'That is good-will, the most valuable of business assets.' "

Wisconsin Concrete Products Association

JACK FRANKLIN, Secretary-Treasurer

TO "do it now" is the admonition of Circular No. 1, issued in February by the Wisconsin Association.

In full, it says, "According to block manufacturers throughout the state of Wisconsin, movements of block are at the lowest they have been in several years. This is also true of the orders for block on the manufacturer's books.

"Most of the manufacturers, however, are looking forward to better conditions two or three months from now. In fact many of them state that they expect considerable building in their communities.

"In general the decline in building is credited to the stock market crash, which downward trend continued rather sharply during November, December and most of January. It is not likely that this will be overcome for two or three months. Just when a 'back-up' will appear does not appear certain but on the other hand it is felt that it is sure to come. A large number of the products plants throughout the state are closed down and manufacturers patiently marking time until orders start coming in.

"It occurs to us that the block manufacturer can use this slack time to most excellent advantage. Why not paint and overhaul your machinery, clean up your plant and yards and get ready for action. This will not cost very much more than the time to do it and will be really economical in that you will be taking care of your investment and decreasing depreciation.

"Another way to occupy your time during this slack period will be to call on all your architects, builders, and bankers, as well as contractors, to say nothing of prospective builders. Business generally is in a slack condition and they will have time now to hear your story which they may not be able to completely hear later due to their own increased activities.

Call on your city officials and see if you can't promote construction of municipal garage or machine sheds. In short, go out now and do your heavy promotion work that you will be able to cash in on later."

An earlier circular letter entitled, "The Last Yard," compares the profit on extra units sold with the last three feet in a football game that make the touchdown.

"Why is it," it is asked, "that Notre Dame, Southern California and other schools have winning teams year after year? There are many reasons, but one of the major ones is that the coach, who is the man behind the machine, is continually learning more efficient plays and getting new ideas on how to make the 'last yard.' "

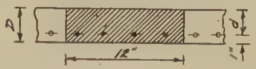
Reinforced Concrete Design Simplified

Chart I_1 (20,000; 800; 15)
Chart I_2 (20,000; 1,000; 12)
Reinforced Concrete Slabs

By JAMES R. GRIFFITH
Professor of Structural Engineering, Oregon State Agricultural College

American Concrete Institute Building Code

$f_s = 20{,}000$ lbs. per sq. in.
$f'_c = 2{,}000$ lbs. per sq. in.
$f_c = 800$ lbs. per sq. in.
$n = 15$
$K = 131$; $p = 0.0075$
$f'_c = 2{,}500$ lbs. per sq. in.
$f_c = 1{,}000$ lbs. per sq. in.
$n = 12$
$K = 164$; $p = 0.0094$



QUANTITY comparisons have been made of beams designed for the different stress limitations. So the same type of comparison will be made for slabs.

Under Chart I (18,000; 800; 15) of the original series, the following problem was solved:

Given, Simple span = 10 ft.
Live-load = 150 lbs. per sq. ft.
From Chart I (18,000; 800; 15)
Overall slab thickness = 5.4 in.
Area of steel = 0.475 sq. in. per ft. of slab.
Using the same span and live-load, I obtain:
From Chart I (20,000; 800; 15)
Overall slab thickness = 5.6 in.
Area of steel = 0.42 sq. in. per ft. of slab.
From Chart I (20,000; 1,000; 12)
Overall slab thickness = 5.2 in.
Area of steel = 0.46 sq. in. per ft. of slab.

The two charts herein presented are solved the same way as the original Chart I: horizontally from the span of proper restraint to the live-load curve; vertically below this intersection will be found the overall slab thickness, and above will be found the necessary area of steel reinforcing per foot of slab.

Tabulating the three results shown above for the illustrative problem, we can make the following comparisons:

TABLE 1—I_1

			—Concrete—		—Steel—	
			Thickness	Per		Per
f_s	f_c	n	Inch	Cent	Area	Cent
18,000	800	15	5.4	100	.475	100
20,000	800	15	5.6	103.5	.42	88.4
20,000	1000	12	5.2	96.3	.46	96.8

Again it will be noticed, that in order to take advantage of the benefits to be derived by increasing the allowable steel stress, a higher concrete stress must be used. However, the final decision cannot be made till costs are compared.

Construction of Charts

Referring to Chart I of the original series, the following

TABLE 2-D_1

$f_c = 800$ lbs. per sq. in.
$w_{LL} = 20$ lbs. per sq. ft.

D	1
2 in.	4.85 ft.
3	8.55
4	11.6
5	14.25
6	16.6
7	18.75
8	20.7
9	22.5
10	24.2
11	25.8
12	27.3

TABLE 3-D_1

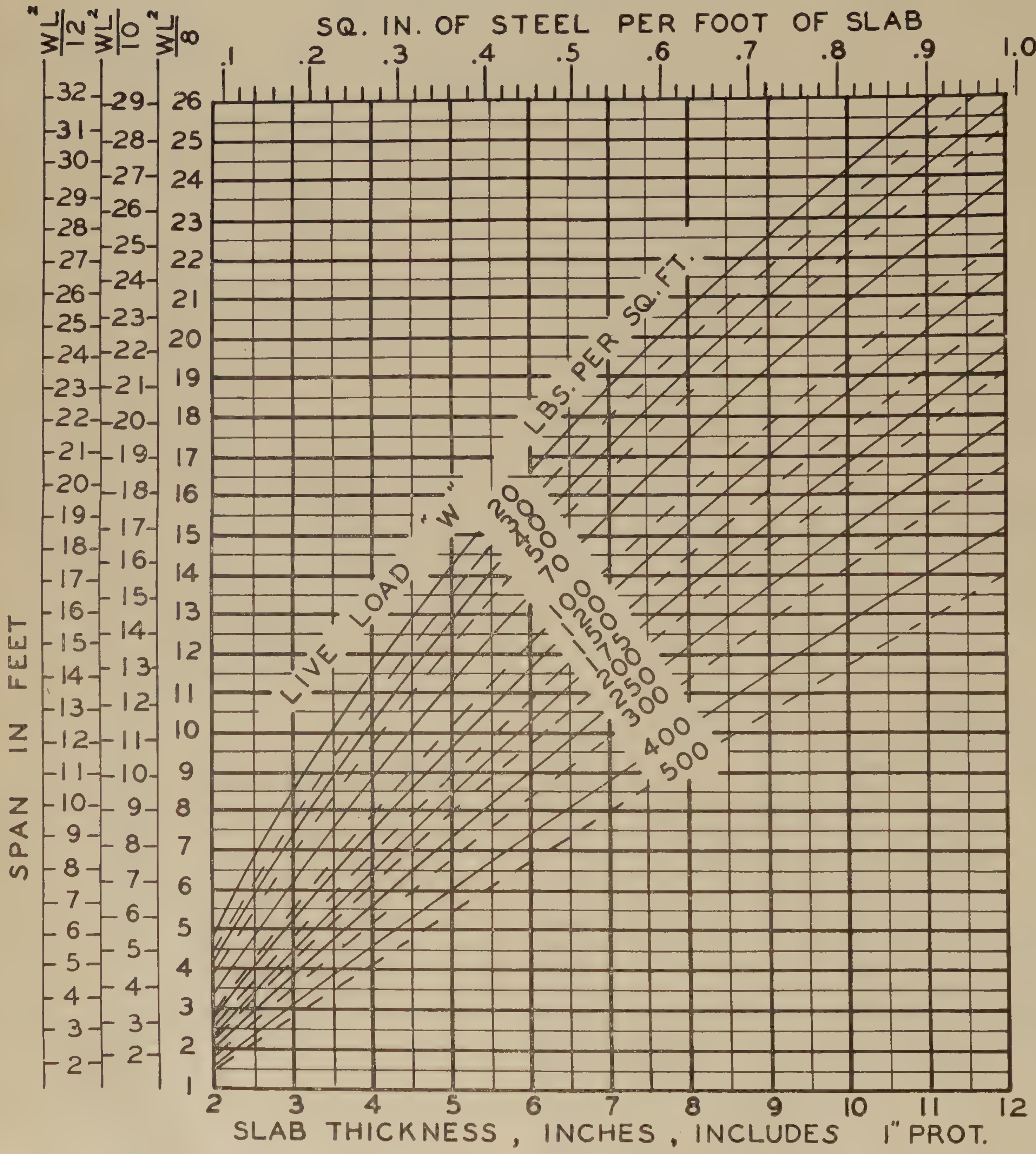
$f_c = 1{,}000$ lbs. per sq. in.
$w_{LL} = 20$ lbs. per sq. in.

D	1
2 in.	5.4 ft.
3	9.57
4	13.0
5	16.0
6	18.6
7	21.0
8	23.15
9	25.2
10	27.1
11	28.9
12	31.3

CHART I_1 (20,000; 800; 15)

Reinforced Concrete Slabs

$f_s = 20{,}000$ lbs. per sq. in.
$f_c = 800$ lbs. per sq. in.
$n = 15$



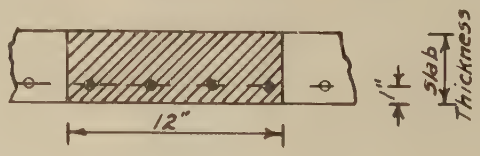
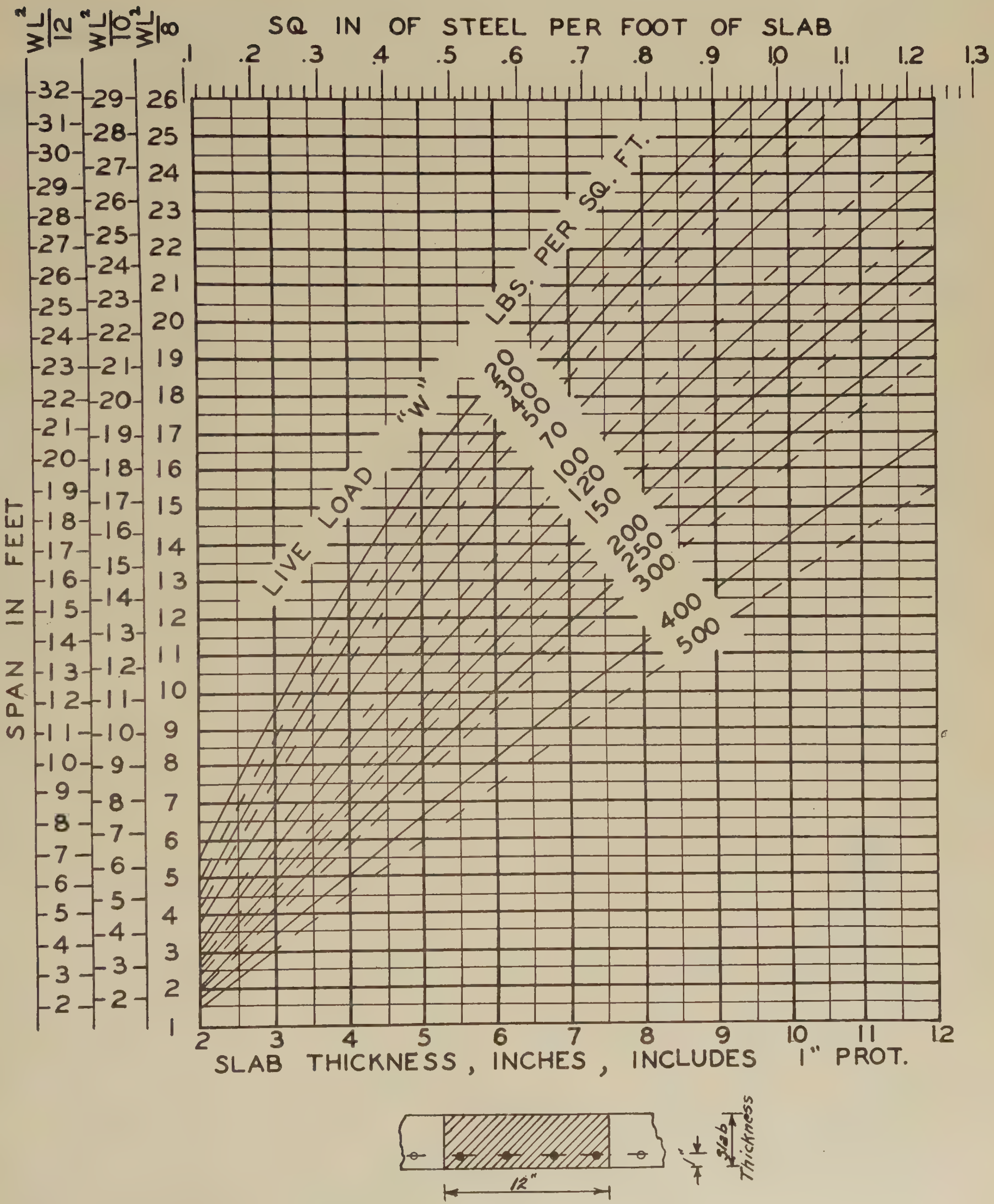


CHART I_2 (20,000; 1,000; 12)

Reinforced Concrete Slabs

$f_s = 20{,}000$ lbs. per sq. in.
$f_c = 1{,}000$ lbs. per sq. in.
$n = 15$



expression was developed:

$$l^2 = \frac{1110\,(D-1)^2}{w_{LL} + 12.5\,D} \qquad \text{Eq. 1-I}$$

The general form of this equation is

$$l^2 = \frac{8\,K\,(D-1)^2}{w_{LL} + 12.5\,D}$$

Substituting the values of K for the different stress limitations, I obtain

For $f_s = 20{,}000$ lbs. per sq. in. and $f_c = 800$ lbs. per sq. in.

$$K = 131$$

$$l^2 = \frac{1048\,(D-1)^2}{w_{LL} + 12.5\,D} \qquad \text{Eq. 1-I}_1$$

For $f_s = 20{,}000$ lbs. per sq. in. and $f_c = 1{,}000$ lbs. per sq. in.

$$K = 164$$

$$l^2 = \frac{1312\,(D-1)^2}{w_{LL} + 12.5\,D} \qquad \text{Eq. 2-I}_1$$

A table was then prepared for each equation. For a given value of (w_{LL}), values of (l) were found for a series of substituted values of (D). This was done for each live-load contour to be plotted. Tables 2-D_1 and 3-D_1 show the values for plotting the live-load contour of $w_{LL} = 20$ lbs. per sq. in. on their respective charts, I_1 and I_2. These values were plotted to rectangular co-ordinates and a smooth curve drawn through the plotted points.

The scale showing the spans for different conditions of restraint is independent of the stress limitations. This scale will then, in both cases, be identical to that plotted for the original Chart I.

The scales giving the area of steel were located as described in the original series, using, however, the new values of (p). For $f_c = 800$ lbs. per sq. in., I found

When $A_s = 0.2$ sq. in.
$D = 3.22$ in.
When $A_s = 0.9$ sq. in.
$D = 11.0$ in.

Likewise for $f_c = 1{,}000$ lbs. per sq. in.

When $A_s = 0.2$ sq. in.
$D = 2.775$ in.
When $A_s = 0.9$ sq. in.
$D = 8.98$ in.

This gave the information to locate two points on each area of steel scale, the intermediate points being located by geometric interpolation.

Standard Specifications Adopted in Annual Pipe Meeting

The twenty-third annual meeting of the American Concrete Pipe Association was held at the Biltmore Hotel, Los Angeles, California, on January 15th and 16th.

The revised Specifications for Reinforced Concrete Sewer Pipe were adopted by the executive committee at its meeting on January 14th. The specifications cover reinforced concrete pipe intended for the construction of sewers. The requirements recognize two classes of pipe, one being designated as standard reinforced concrete sewer pipe and the other as extra-strength reinforced concrete sewer pipe.

The specifications deal with the requirements for materials, design, physical tests, permissible variations from nominal size, workmanship and finish, marking, and inspection and rejection.

Among the papers read at the meeting was one on "The Flow of Water in Concrete Pipe," by Fred C. Scobey, senior irrigation engineer, Division of Agricultural Engineering, U. S. Department of Commerce; another on "The Concrete Pipe Industry in the Northwest," by W. H. Sharp, manager of the Longview (Wash.) Concrete Pipe Co.; "Concrete Pipe Design and Installation," by A. M. Rawn, assistant chief engineer, Los Angeles County Sanitation Districts; and a joint paper on "Concrete Irrigation Pipe in California," by B. J. Ukropina, vice-president and general manager of the United Concrete Pipe Co., of Los Angeles, and H. W. Chutter, secretary of the Jourdan Concrete Pipe Co., Fresno, Calif.

Ohio Burial Vault Manufacturers Become "National"

The Ohio Concrete Burial Vault Association held its third annual convention at Columbus, Ohio, on February 5th and 6th. The attendance was considerably greater than had been anticipated, men from eight states being present and taking part in the discussion.

It was this evidence of its more than state-wide scope that brought about the action at the meeting effecting a change in the name from "Ohio" to "National" Concrete Burial Vault Association. Memberships are held by manufacturers in twelve states.

The program included talks and discussions on a standardized specification, advertising and salesmanship. A committee is developing quality and material standards.

H. A. Ledyard, Ashland, Ohio, was elected president; Ross Hilles, Alliance, Ohio, vice-president, and J. H. Stuart, Bremen, Ohio, secretary-treasurer.

Quantity Surveyors Meeting

The fifth annual convention of the American Institute of Quantity Surveyors will be held at St. Louis, Mo., April 14th to 16th, both inclusive.

Differences in Portland Cements

By THADDEUS MERRIMAN

Chief Engineer, Board of Water Supply, City of New York

LAST year, in the March issue of CONCRETE, the writer indicated that the engineer was rapidly coming to view his portland cement more scientifically. This trend has been continuing. Under a specification that contained no requirement as to elongation of steel, many differing grades of steel could be offered. This is exactly the condition under the present portland cement specification, which classifies nearly all portland cements as equals. Under that specification all are excellent, yet each differs in important respects from the other.

The differences between cements come most strikingly to the fore when they are used under conditions of outdoor exposure and in concrete dams. For this service a test is urgently needed for the purpose of distinguishing between the quality of cements which are offered at the same price and even between those which come at higher figures. With such a test at his command, the engineer will be able to select that cement which will produce the best job and make the most permanent concrete. It is encouraging to know that much effort and study are being put forth in this direction and it is hoped that the practical realization of the next step in the determination of cement quality is not far distant.

Looking Back on 1929

By "SPEC" COLLINS

AGAIN we spin the crystal ball, this time backward instead of forward, to see how many of the predictions made a year ago have come true.

Most certainly 1929 was a year of aggressive selling. The concrete products industry has brought into its ranks many salesmen skilled in the art of selling and has educated them to know concrete products. Other salesmen have been developed within organizations and these men, knowing concrete products, have been taught the art of selling. There has been a decided improvement in the quality of salesmanship in the concrete products field during the past year which has resulted in more high class jobs than during any other previous twelve months' period. The industry has felt the need of higher grade salesmanship and has spent more time equipping its salesmen with not only selling points, but with technical data that has given them an entree to many hitherto inaccessible outlets. High class sales engineers are being developed in the concrete products industry. There has been no tendency toward the development of brokers in the industry, the feeling being that this method of selling would defeat the purpose of many personal contacts previously made.

The Past Year Has Brought to the Concrete Products Industry—

1. An increase in number of salesmen of approximately 14 per cent.
2. Aggressive promotion of co-operative selling. Little accomplished toward co-operative advertising.
3. Some tendency toward mergers of plants with aid of outside capital. Total number of plants reduced by 15 per cent.
4. Greater use of concrete units in large buildings.
5. Some progress in development of high pressure curing.
6. Some improvement in quality, especially in light-weight units.
7. Greater diversification of products including development in fireproofing units, floor tile and roofing slabs.

Greater co-operative effort has displayed itself among the concrete products manufacturers in many sections. Particularly to be noted are the co-operative selling organizations now to be found in Milwaukee, Minneapolis and St. Paul. In other sections of the country there has been a drawing together of manufacturers for the purpose of co-operative advertising and the stimulation of promotional efforts. Little has been accomplished during the past year in advertising in a national way, but much more is being expected in the future.

According to a recent survey there has been a 15 per cent decrease in the number of concrete products plants in the United States during the year 1929. These plants have automatically forced themselves out of business by unprogressive manufacturing and merchandising. To take their place there has been developed a number of large plants adequately financed, strongly staffed and with aggressive selling organizations. This development is a logical one and will take place each year as long as inefficient and unprogressive operators stay in business.

The year 1929 was outstanding in the industry, in the construction of public and industrial buildings of concrete masonry. This has been confined to no one section but is to be found from the Atlantic to the Pacific and from Montreal to Texas. These large buildings, taking many hundreds of thousands of units, have proved such an inspiration to manufacturers in every section of the country that, without a doubt, there will be a huge volume of this business within the next few years. It is worthwhile to know that this class of construction has not gone entirely to light-weight units. On the contrary, some of the largest and most outstanding jobs have utilized many thousands of sand units.

The most notable effort to increase production in concrete products plants is coming about by payment in many cases on a piece work basis and through slight development of the multiple shift idea. This latter has not advanced as swiftly as was expected, but is gaining a foothold in the eastern states. Probably the most notable achievement toward speedy production has been the amount of experimentation on high pressure curing.

A decrease in volume, due to the building decline in the United States, has not made a development in productive efficiency as pronounced as was thought possible. There has been some improvement during 1929 in the quality of concrete in most concrete masonry units, both light-weight and ordinary. A tendency toward larger air space has made this improvement necessary.

Not much progress has been made during the past year in the development of new light-weight aggregates. With a large field awaiting it, many anticipated this development to move forward rapidly; but instead, we find conditions in the light-weight aggregate field practically unchanged from a year ago. There has been a pronounced diversification in the number of concrete units manufactured and sold by individual plants, particularly such units as partition tile, fireproofing units, insulating slabs for roofs and precast floor slabs. Many manufacturers have added sidelines such as roofing tile, manhole units and other specialties in order to help absorb initial plant overhead.

While few mergers or consolidations have taken place during the past year, the sentiment toward this method of operation in the concrete products industry is fast crystallizing. Without a doubt, many negotiations started and carried on during 1929 will bear fruit in 1930. Competition has reached such a dangerous point and the need for skilled management both in manufacturing and selling has become so apparent that consolidations are bound to come within the next few years.

New Books and Pamphlets

Forms for Concrete Ribbed Floors

Simplified Practice Recommendation R87-29. Published by the Bureau of Standards of the U. S. Department of Commerce. This is a pamphlet covering sizes of removable and permanent forms, pans or domes made of wood, steel or other material used in concrete ribbed floor construction.

This standardization was accomplished through various conferences between representative manufacturers and distributors, acting in co-operation with the Department of Commerce in the department's campaign for the elimination of waste.

The first of the general conferences on this work was held on March 21, 1928. As the result of this and later conferences, supplemented by correspondence received from organizations that were unable to send representatives, a reduction of 71 per cent in the number of commercial sizes was effected. Copies of the pamphlet may be obtained at 5 cents each from the Superintendent of Documents, Government Printing Office, Washington, D. C.

Products Plant Operation

Pre-Cast Concrete Factory Operation. By H. L. Childe. Published by Concrete Publications, Ltd., London, England. 216 pages; 5½ by 8½ in.

This book contains illustrated descriptions of a number of concrete products and cast stone factory layouts. Actual manufacturing plants are used in these descriptions. The examples selected, when considered collectively, cover every type of precast concrete unit, and almost every conceivable kind of location. There is a well-illustrated chapter on ideal plant layouts for various assumed or actual conditions.

Mineral Aggregates Symposium

Symposium on Mineral Aggregates. Published by the American Society for Testing Materials, Philadelphia, Pa.

This publication includes under one cover the papers and discussions on this subject presented at the annual meeting in June, 1929.

Among the papers are an introduction by R. W. Crum, director of the Highway Research Board, Washington, D. C.; a paper on methods of inspection of mineral aggregates, by A. S. Rea, chief engineer, Bureau of Tests, Ohio State Department of Highways, Columbus; fine aggregate in concrete, by H. F. Gonnerman, manager, research laboratory, Portland Cement Association, Chicago; fine aggregate in mortar and plaster, by J. C. Pearson, assistant to chemical engineer, Lehigh Portland Cement Co., Allentown, Pa.; influence of quality of coarse aggregate on strength of concrete, by F. C. Lang, engineer of tests and inspection, Minnesota State Highway Department, St. Paul; influence of coarse aggregate on durability of concrete, by F. R. McMillan, director of research, Portland Cement Association, Chicago, and George W. Ward, petographer, Portland Cement Association, Chicago, on the influence of mineral composition of aggregates on fire resistance of concrete, by S. H. Ingberg, chief of fire resistance section, U. S. Bureau of Standards, Washington, D. C.; and needed research on mineral aggregates, by F. H. Jackson, engineer of tests, U. S. Bureau of Public Roads, Washington, D. C.

The pamphlet includes discussions by M. H. Ulman, L. E. Williams, A. T. Goldbeck, Shreve Clark, D. D. McGuire, Stanton Walker, W. F. Purrington, W. H. Herschel, H. W. Skidmore, Meyer Hirschthal, Bailey Tremper, Harold Allen, R. B. Gage, H. F. Kriege, Fred Hubbard, C. E. Proudley, P. J. Freeman, A. N. Talbot and H. J. Gilkey, and additional discussions by several of the authors.

Rules for Concrete Making

Basic Principles of Concrete Making. By Franklin R. McMillan. Published by the McGraw-Hill Book Co., New York. One-hundred pages, 6 by 9 in.

The author of this book has written it from the viewpoint of the construction superintendent or the engineer who has some familiarity with the literature on concrete making. It is for these men that the book is written, rather than for the man at the mixer.

As the title implies, the discussions start with basic principles. The reader is given the underlying facts relating to the action of concrete during hardening, the factors that influence compressive strength and density, the effect of the water-cement ratio, and the selection of aggregates. A final chapter deals with the importance of proper construction methods.

Federal Specifications Index

Alphabetical Index and Numerical List of Federal Specifications Promulgated by the Federal Specifications Board. A circular of the Bureau of Standards, U. S. Department of Commerce.

This 18-page leaflet lists specifications which have been officially adopted and promulgated by the Federal Specifications Board as federal specifications for the mandatory use of all departments and independent establishments of the government. The specifications are listed, first, alphabetically, and then numerically, according to federal specification number.

Revised Standard for Shovels, Spades and Scoops

The U. S. Department of Commerce Simplified Practice Recommendation No. 48—Shovels, Spades and Scoops, dealing with grades and sizes, which was originally adopted in June, 1927, has been revised to include a section on finishes. The original standardization resulted in reducing the number of varieties of shovels from 5,136 to 2,178. It is said that more than 96 per cent of the shovels, spades and scoops now being manufactured are being made in accordance with Simplified Practice Recommendation No. 48, copies of which may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C.

Coming Conventions

March 24th to 28th—Building Officials Conference of America, sixteenth annual meeting, Hotel Hollendon, Cleveland, Ohio.

March 31st to April 2nd—Concrete Reinforcing Steel Institute sixth annual meeting. Bon-Air Vanderbilt Hotel, Augusta, Ga.

Concrete for the Builder

Burglarproof and Fireproof Vaults for Banks and Hospitals

Opportunity for Profitable Contracts in Special Field Without Competition—Concrete of High Quality Needed—Special Equipment for Vaults

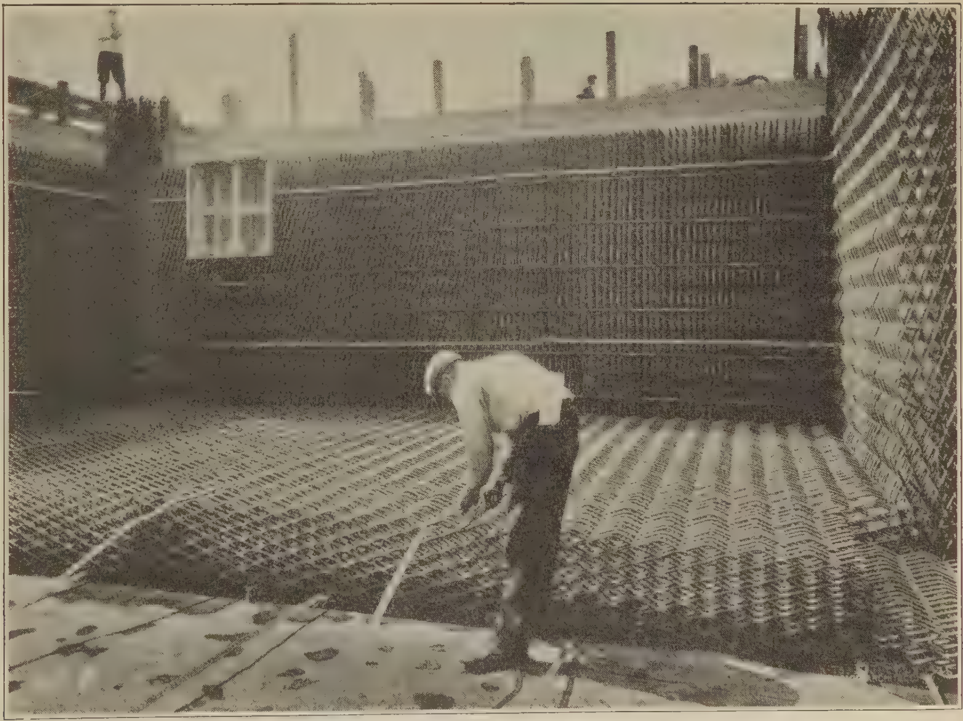
By L. H. CORNING
Structural Engineer

BANKS have always been the target of the professional burglar. The fact that a bank, and more especially the vault built within its walls, is a storage place for money and other valuable property, makes it at once a temptation and a challenge to this particular member of the criminal element.

The intelligence and skill of the concrete contractor and vault designer must prevail over the skill of the burglar, if the valuable possessions of the community are to be secure. In a word, the concrete contractor must build vault walls and ceilings of heavily reinforced concrete which the burglar cannot penetrate in the time available for such an attack.

Convincing the Local Bankers

Enterprising concrete contractors will recognize the opportunity to obtain profitable contracts for burglarproof vault construction from each of the banks in his community that does not have a vault of this type. There will be little difficulty in convincing the bankers that



This vertical system of vault reinforcement when installed in 18 inches of concrete, as shown, obtains underwriters' approval on insurance rating walls of ordinary masonry furnish very little security. Burglars equipped with air hammers, high explosives, and cutting torch can cut through walls of such construction in a very few minutes. Attention called to newspaper accounts of bank burglaries occurring almost daily will help to convince obdurate bankers of the necessity of a modern vault.

No Competition

The highly specialized nature of this class of work is one of the most attractive features from the standpoint of the contractor and for this reason it will not be undertaken by every building contractor in town. The concrete contractor who develops the business is consequently fairly sure of getting the contracts, and at a price which will return a reasonable profit.

Suitability of Coarse Aggregates

The coarse aggregates for the concrete to be used in the vault construction must be a kind that will not spall when subjected to the heat of a fire in the building. Tests indicate a considerable difference in the effect of fire on concrete made of various types of coarse aggregate. Quartz, chert, or granite cause spalling and cracking of the concrete when subjected to excessive heat for long periods, while concrete in which the coarse aggregate is trap rock, limestone, or calcareous gravel, or some special aggregate such as blast-furnace slag, shows little effect even from very severe fires. In localities where the better materials are not available, the recommended practice is to increase the thickness of the protective covering on the outside of the reinforcement.

Underwriters' Requirements

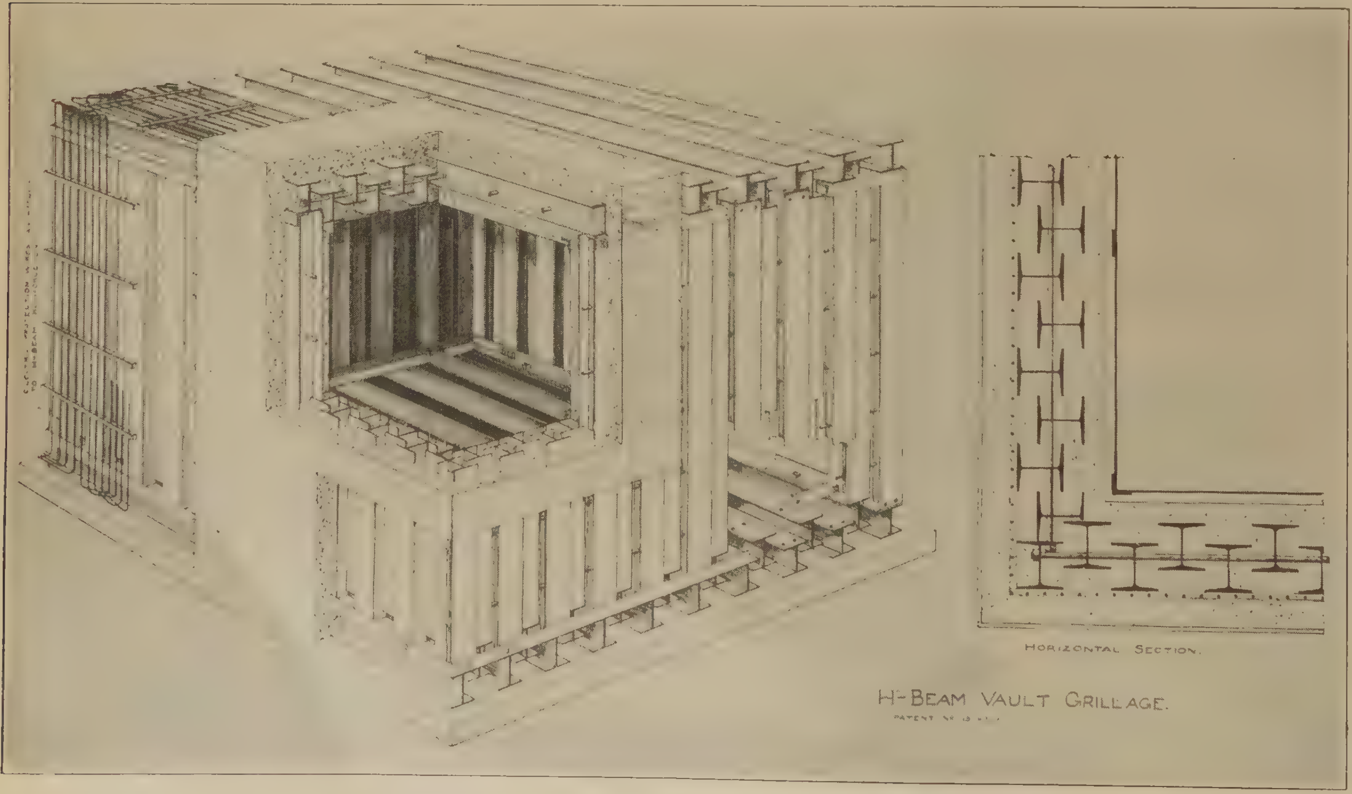
Bank vault construction, in addition to being constructed of high-grade concrete heavily reinforced with specially designed reinforcement, should be augmented by electrical alarm systems as protection against both burglary and fire.

An important fact that appeals to bankers is that the National Bureau of Casualty and Surety Underwriters gives the very best rating to vaults in which the floor, roof and walls are built in accordance with certain minimum construction requirements. For instance, the walls are to be of concrete reinforced with certain systems of mesh, frames, or structural sections which are approved by this organization of underwriters. The contractor who undertakes to do this class of work should build in strict compliance with these requirements in order to give his banker client the lowest possible insurance rate.

Bank Vault Reinforcement

Several systems of reinforcing for concrete vaults have been devised which offer a maximum resistance to penetration. The ordinary reinforcement sufficient to carry structural stresses is inadequate to afford burglary protection. The reinforcement should not only be sufficient to carry all ordinary loads, but should present the greatest possible resistance to shattering from the use of explosives. It must offer the greatest possible number of steel sections to be cut through or burned off in the process of forcing an entrance through the walls.

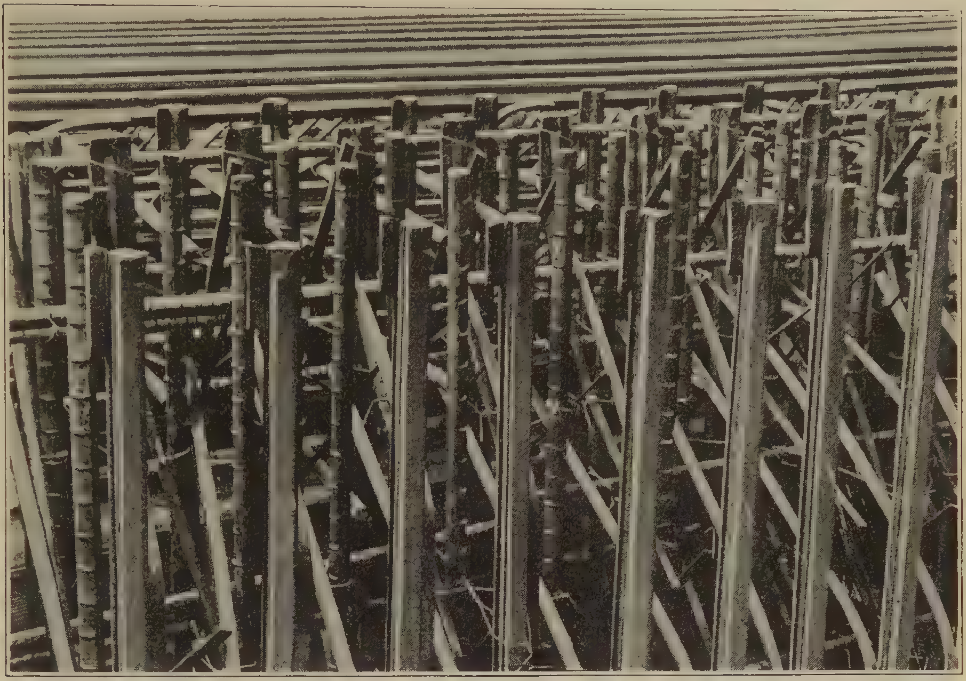
The reinforcement must be so arranged in the wall as to have the maximum amount of steel at right angles to a vertical plane of cleavage which is parallel to the face of the wall. This is necessary in order to prevent splitting by an explosive charge. It therefore follows that the reinforcement should be of such design that it can be placed in vertical or horizontal layers extending from face to face of the wall, and never arranged in layers parallel to the wall surface. This is accomplished most economically by the use of one of the approved systems of reinforcement previously mentioned, for they are manufactured especially for this purpose. A close spacing of the reinforcement is necessary to give the largest possible number of sections of steel per cubic foot of wall.



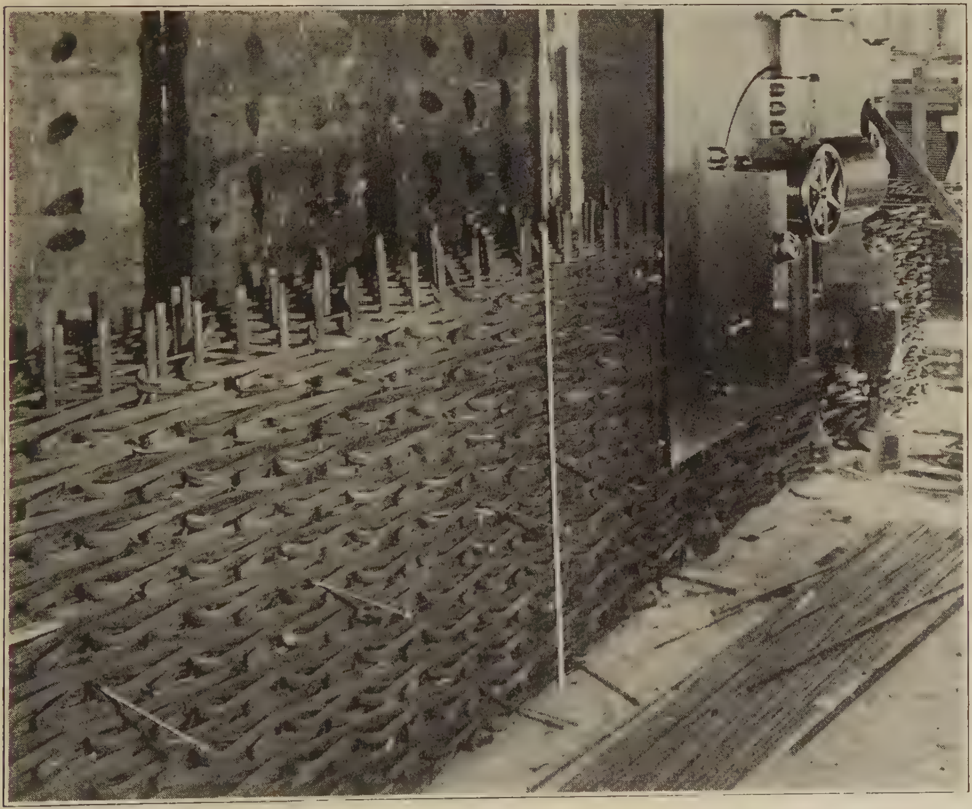
The staggered arrangement of structural shapes in H-beam vault grillage effectively prevents the formation of cleavage planes in the concrete and minimizes the effect of an explosion

The special systems of vault reinforcement approved by the National Bureau of Casualty and Surety Underwriters must be placed in accordance with drawings and specifications furnished by the manufacturer. Some of these approved systems are shown.

The close spacing of steel in bank vaults requires particular care with the concrete mixture, which must thoroughly fill the inter-spaces in the reinforcement. A hard, tough, tool-resistant concrete must be obtained in order that it is not readily chipped from between and around the reinforcement, thus exposing it to the cutting torch. These requirements are easily and satisfactorily fulfilled



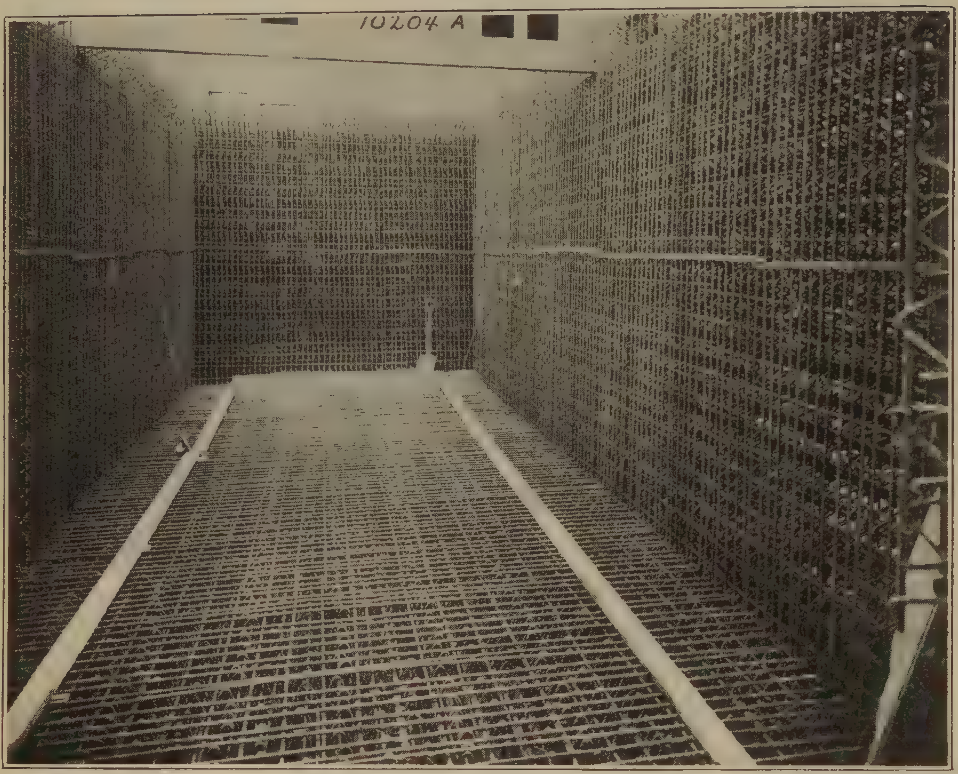
Pre-fabricated vault reinforcing frames are closely interlaced with heavy tool-resistant deformed steel bars in this system



Horizontal type of reinforcement. An impenetrable mass of reinforcement is clearly illustrated in this view by the proper selection of aggregates and by following modern methods of design and control of concrete mixtures.

Vaults for Storage of Dangerous Chemicals

The local banks, however, are not the only prospects for modern vault construction. Hospitals must have fireproof vaults for the storage of x-ray films and other dangerous chemicals. Some industrial plants use highly explosive or otherwise dangerous chemicals in their manufacturing processes. All of these establishments are prospects for the energetic concrete contractor who familiarizes himself with the special requirements of vault construction.



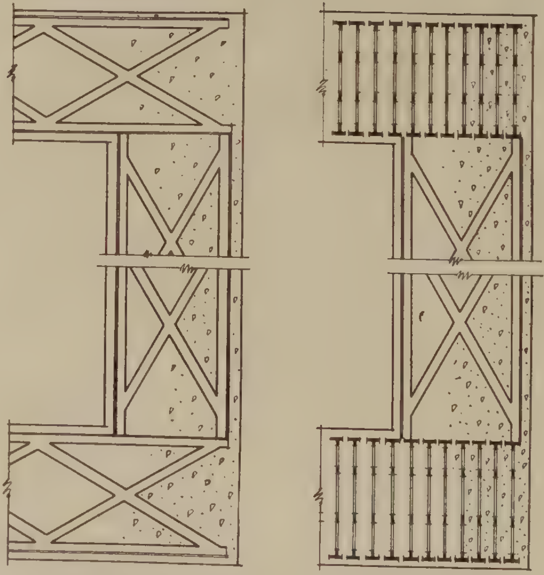
Interior view of vault constructed with vertical system of vault reinforcing prior t opouring floor. The floor and wall reinforcing are shown in place

In the case of bank vaults, the problem in hand involves security against both fire and burglars. In the case of vaults for the storage of chemicals, the problem is primarily one of fireproofing, and the requirements are less severe than with bank vaults.

X-ray films and certain chemicals which under the action of heat give off deadly gases should at all times be stored in such a way as to forestall disastrous fires. The reinforced concrete vaults in which these materials are stored must be equipped with efficient safety controls to insure the closing of doors, and the opening of vents directly to the outside of the building for the removal of fumes in the event of fire within the vault.

Location of Storage Vaults

In the location of such vaults it is of importance to guard against the result of possible failure of the safety mechanism or the blocking of the door at the time of emergency. Since the majority of gases are lighter than air, the location of the storage vault for dangerous chemicals on the top floor or the roof of the building will prevent deadly fumes from spreading throughout the building by way of the stairways, elevator shafts and ventilating ducts. When vaults are located in the upper stories of a building they should be supported on fireproofed columns and girders capable of resisting a fire attack for the same length of time as the vault itself. Insurance regulations, as stipulated by the National Fire Protection Association, should be studied and complied with in this regard.



Sections through vault showing vertical system of reinforcement using expanded steel joists

Thickness Required for Walls, Floors and Roof

Whether the vault is built directly on the ground or is supported in the upper floors of the building, the walls should be not less than 12 inches thick to insure complete protection of the contents under the most severe conditions of fire exposure. The floor of the vault should have a minimum thickness of 6 inches. The roof should be 8 inches thick unless the roof of the building forms the roof of the vault, in which case the nominal roof thickness will be sufficient. Enough reinforcement must be provided to carry all loads which may be imposed on the walls, roof or floor of the vault. Due consideration should be given to the possibility of severe impact from falling floors and walls of the building, if the vault is built within a building that is not otherwise of fireproof construction. Where the roof of the vault is not the roof of the building, it should be designed for a load of not less than 350 pounds per square foot to take care of impact. Under no circumstances should the reinforcement in the walls, floor or roof of the vault be less than ½-inch round bars spaced 4 inches on centers in both directions and on both faces of the slab, and embedded so as to have at least 2 inches of concrete outside the steel.

Storage vaults should be provided with automatic sprinkler systems. Heating of storage vaults should be avoided if possible, but if absolutely necessary it should be attained by a system of hot water or low pressure steam. High pressure steam should not be used under any circumstances, since the temperature may be such as to cause decomposition of certain stored chemicals. Lighting of the vault should be by means of guarded bulbs in vapor-proof globes. Extension cords must not be permitted. Vaults containing chemicals or substances giving off toxic gases when exposed to heat should be vented to the outer air. A correctly designed reinforced concrete vault will insure protection against the most destructive fire, and its value is reflected favorably in insurance rates, and in the assurance of safety to the occupants of buildings. Properly constructed vaults may prevent the loss of large sums of money through fire and through damage suits resulting from injury or death of persons in or around the buildings.

Reinforced Concrete Checker Tables

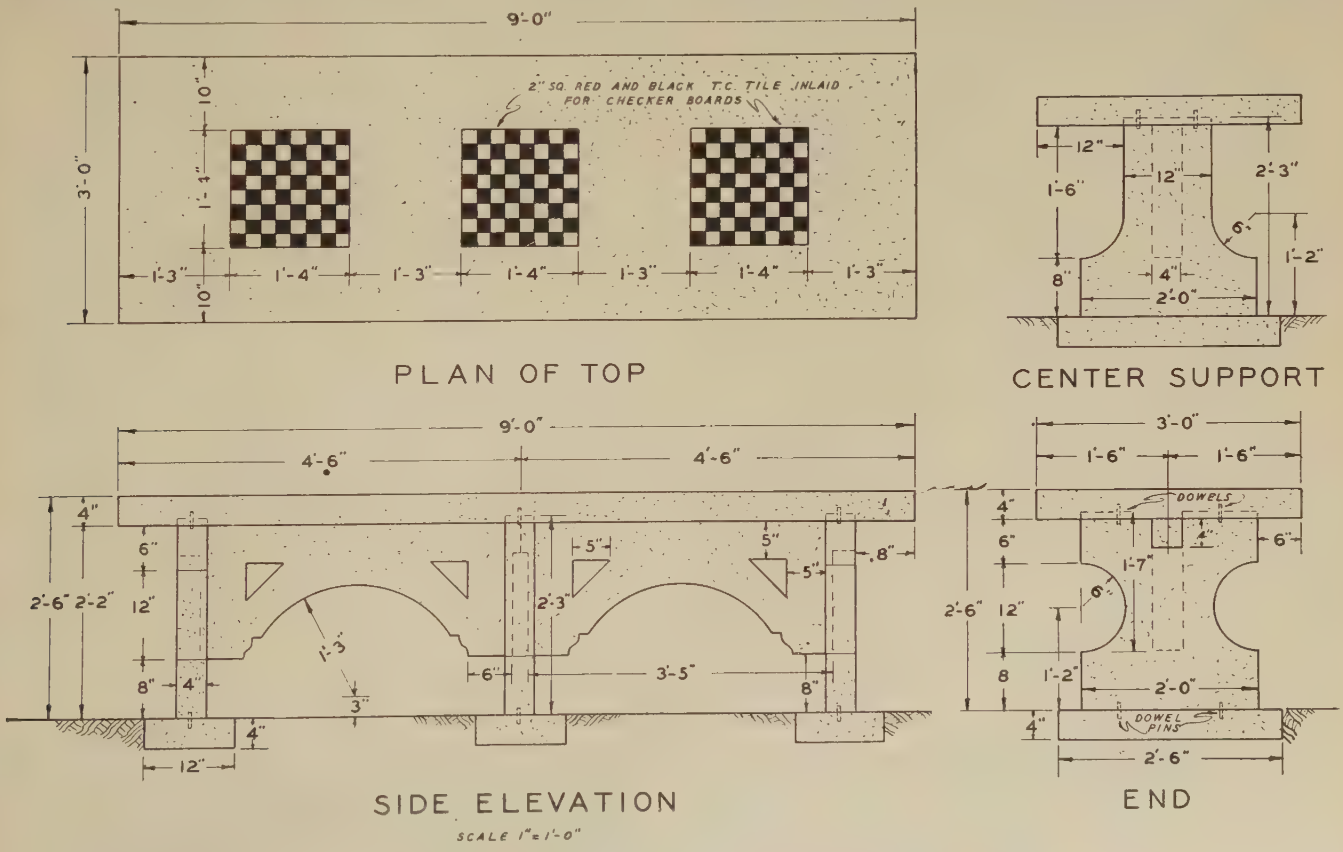
How Jacksonville Designed and Built Checker Tables For Its Playgrounds

By L. C. HILL

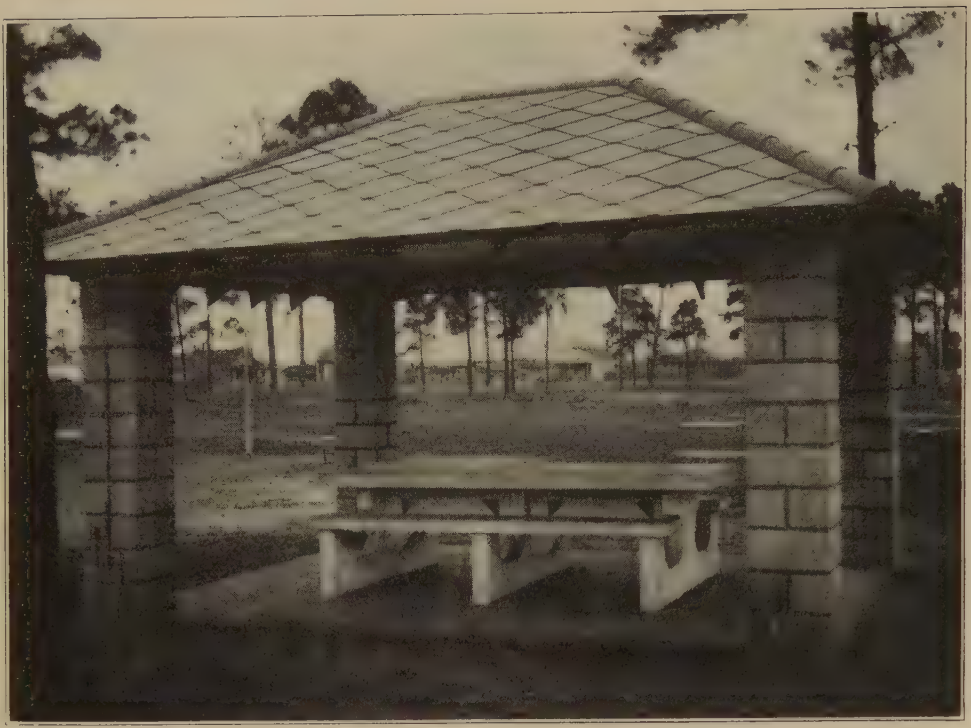
A RECENT addition to the park equipment of Jacksonville, Florida, includes a number of reinforced concrete tables for playing checkers.

The first tables built were supplied with wooden benches, but these were often carried away to other locations. A combination checker table with seats attached finally proved to be the best solution.

Each table contains three checker boards made of 2-in. square red and black vitreous terra-cotta tile, inlaid flush with the surface of the table. The table is precast in

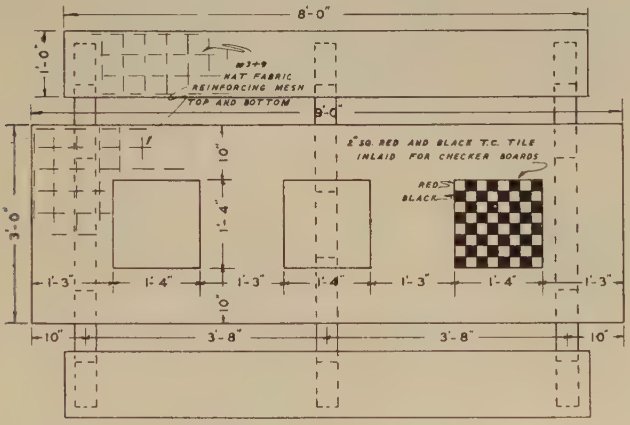


Design of one of the two types of checker tables

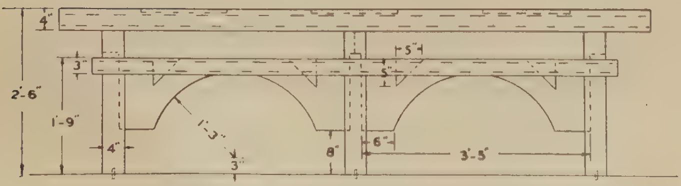


One of the sheltered reinforced concrete checker tables designed and installed by the Jacksonville Playgrounds Department

several units to facilitate handling. The units are doweled together, after which the assembled table is bedded in cement mortar and doweled into the concrete floor upon which it rests. It is then given two coats of white cement paint.



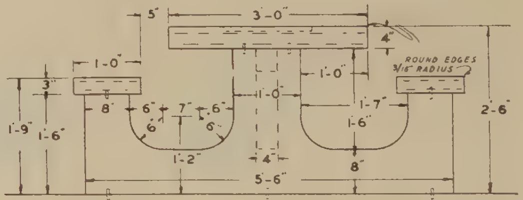
PLAN



SIDE ELEVATION

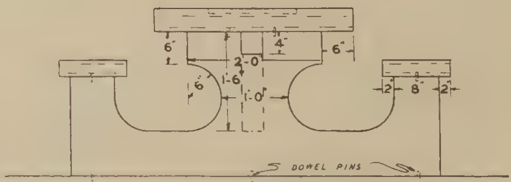
The table top is reinforced with two layers of wire fabric, one layer near the top and one near the bottom of the slab. One layer of wire runs lengthwise of the slab and the other crosswise. The reinforcement also permits handling and transporting of the units without breakage.

The tables were designed and their construction supervised by the writer, acting under the direction of J. E. Byrnes, secretary of the Playgrounds Department of the City of Jacksonville.



CENTER SUPPORT

SCALE 1"=1-0



END SUPPORT

Design of the checker tables with seats attached

Cemetery Marker Manufacture

Using a frost auger and a tin can as the form eight hundred cemetery concrete markers were completed recently for a Longmont, Colo., burial ground.

A 4-in. hole was augered and filled with concrete. The top of the marker was shaped with the can and the lot number later applied by means of a stencil.

Being about a foot long, the markers are easily moved when necessary, but are not readily disturbed and lost.

How to Build
Concrete Sidewalks

Modern Walks of One-Course Construction—Information on Sub-base, Width, Proportions, Joints, and Other Helpful Hints

CONSTRUCTION methods and design for concrete sidewalks have been somewhat standardized by experience. However, the general practice now is to build one-course sidewalks, which have proved far superior to the two-course and cost no more. For example, a 5-inch, one-course 1:2:3 walk requires about 10½ sacks of cement per 100 sq. ft. and a two-course walk made up of a 1:2½:4 base that is 4¼ inches thick and a 1:2 mortar top that is ¾-inch thick requires a little over 10 sacks of cement per 100 sq. ft.

Concrete builders like to build the one-course walk because it can be completed in one operation without altering the materials going into the mixer, and can be finished with labor-saving tools similar to those used for pavements. In addition, the one-course walk is stronger and there is no danger of a separation of top and base—a fault which has ruined many poorly built two-course walks. The gritty, wood-floated surface of the one-course walk is safer in slippery weather and when that fact is brought to the attention of pedestrians and municipal officials, they favor the coarser grained surface.

Of course, two-course concrete sidewalks can be given a finer grained finish than one-course, and are sometimes preferred by property owners on that account. Where special surface finishes are required, it is sometimes desirable to use two-course construction.*

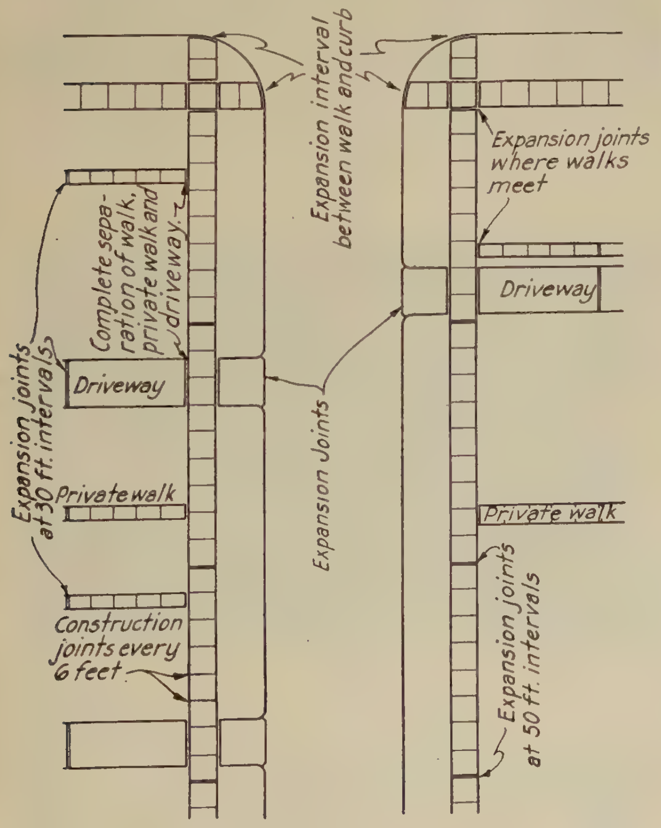

Expansion interval between walk and curb
Expansion joints where walks meet
Complete separation of walk, private walk and driveway.
Driveway
Driveway
Expansion joints at 30 ft. intervals
Expansion Joints
Private walk
Private walk
Construction joints every 6 feet
Expansion joints at 50 ft. intervals

Diagram of joint spacing for concrete walks and drives. Walks should be separate blocks not more than 6 ft. on a side with expansion joints at 50 ft. intervals. Expansion joints should separate walks from driveway, curbs and other walks

Location and Design of Walks

In residential communities the location of walks is usually near the property line with a strip of lawn between curb and walk. Sidewalks may curve around trees, however, but allowance should be made for growth of trees. A minimum width of 5 feet is desirable; 6 feet is better. Greater widths may be necessary near schools, churches and similar locations. A width of 4 to 6 feet may be used across large lawns or approaching wide porches; narrower widths look better around houses and between houses and garages. At places where automobiles discharge many passengers—apartment buildings, churches, schools and clubs—narrow walks are built next to the curbs with crosswalks to the main walk. This is work that concrete builders can promote.

After subgrade is prepared, in two-course construction, a base course of dry mix is tamped to ¾ in. below top of forms

Walks in business districts usually extend from the building line to the curb. Thus the space available determines the width.

One and two-course walks in residential sections should be not less than 5 inches thick; two-course walks should have a 4¼-inch minimum base and a ¾-inch wearing surface. An additional 1-inch of thickness is recommended at drives and across alleys. Because business and industrial walks have to resist weight and impact of boxes dropped from trucks, 6 inches is a desirable minimum thickness. Walks over basements must be specially designed with proper thickness and reinforcement.

For surface drainage, a slope of ¼-inch to the foot is sufficient for practically all walks. In general, the slope should be toward the curb over the entire width of walk.

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*An article on colored walks and special surface treatments will be published in an early issue.

Preparing the Subgrade

The subgrade must have uniform bearing power. That is, all soft places must be filled with solid material; exceptionally well compacted spots must be loosened and tamped. Fills must be packed solidly, the material being placed and tamped in 6-inch layers and extending at least 1 foot beyond edges of walk.

Concrete may be placed on the subgrade directly from the mixer or with barrows. A one-course job is seen above

A special sub-base of cinders or other porous material is not necessary under all walks, for a well-compacted, well-drained subgrade is satisfactory. The expense of a special sub-base is justified only when subgrades are water-soaked much of the time. Even in this case, tile drains are often the best cure. A line of tile is sometimes placed parallel to and near the walk on the uphill side of the slope. Where tiling is impracticable, a sub-base of porous material will be satisfactory provided a drain is placed to carry away water which collects under the walk.

Concrete must be spaded against forms and struck off with template or screed. Metal division plates are placed in advance as work progresses, as shown in this one-course construction

Forms for Sidewalks

Forms may be of wood or metal, firmly held to line and grade with upper edge of the form corresponding to the finished grade of the walk. Division lines should be plainly marked on both side forms to locate position of cross forms for joints and to give the dividing line to be cut through by the groover. Metal cross forms are the most satisfactory, being placed to completely separate slabs and perpendicular to the surface of walk. Separation plates, 1/8 to 3/16-inch thick, cut to the cross section of the walk and provided with a square lug on each end which fits a notch in the side forms, should always be required.

Materials—Selecting and Measuring

Sand should be clean, free from fine dirt, loam, clay or vegetable matter, and well graded with particles ranging from fine up to those that will just pass a 1/4-inch screen. Coarse aggregate should be well graded, in sizes ranging from 1/4-inch to 1 inch. The water used should be clean enough to drink.

Two-course construction requires the placing of a 3/4-in. mortar top on the base course and striking off with template or screed

Approximate proportions recommended are as follows:

For one-course walks—1 part portland cement; 2 parts sand or screenings; 3 parts crushed stone or pebbles; 6 1/4 gals. of water (maximum) per sack of cement.

Base course for two-course walks—1 part portland cement; 2 1/2 parts sand or screenings; 4 parts crushed stone or pebbles; 6 1/4 gals. of water (maximum) per sack of cement.

Wearing course for two-course walks—1 part portland cement; 2 parts sand or stone screenings; minimum of water to give workable mix.

All proportions should be measured by volume. Using a shovelful of cement to a certain number of shovels of sand and stone is not measuring, however. With dry materials, 6 1/4 gals. of mixing water is the correct amount. With moist aggregates use 4 3/4 gals.; with really wet materials, 4 gals. per sack of cement.

A wood float or belt is best adapted for finishing. The surface resulting is smooth, yet rough enough to provide sure footing

Concrete should be mixed in a batch mixer for a full minute.

Placing Concrete for Sidewalks

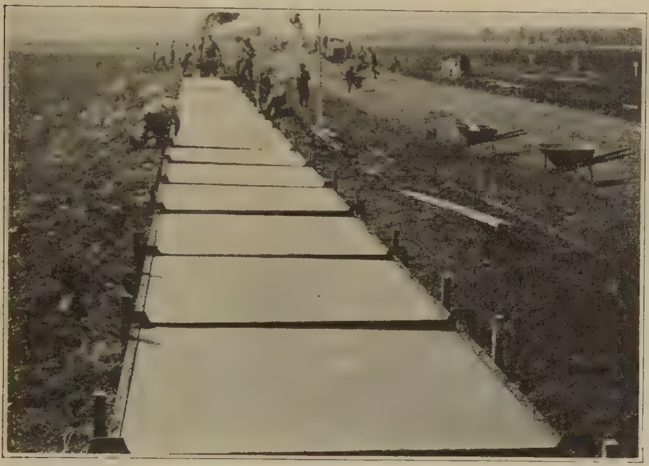
In one-course work the concrete is placed in the forms, then tamped and struck off with a template or screed riding on the side forms. It is best to place the material a little high.

In two-course work the base is first placed and tamped, spreading the concrete to about the height of the side forms and compacting enough to allow a ¾-inch space for the wearing surface. The top course must be applied as soon as possible—never later than 45 minutes after the base course is placed. This practice insures good bond between the two courses. Concrete for each slab must be placed continuously so the entire slab will harden as one unit. If work has to be suspended, finish both courses against a bulkhead to obtain a vertical joint.

Placing of Joints

Construction joints are separation planes between slabs, placed so that the walk will be cut into separate slabs not longer than 6 feet. They are best made by placing metal division plates as shown in an accompanying illustration.

Premolded expansion joints, ½-inch thick, are placed at intervals of about 50 feet throughout the length of the walk; care being taken to keep joint material at right angles to center line of walk and perpendicular to its surface. Expansion joints should also be placed on all four sides of the square formed by the intersection of two walks, between curbs and walks and between sidewalks and buildings or other rigid structures.



When surface is finished, division plates shown in this one-course construction, are removed. The surface must be protected during curing

Finishing

Most concrete walks are now finished with a wood float. This produces a slightly roughened surface that insures greatest safety under all weather conditions. After the concrete is struck off, it is smoothed with the float, leveling off any high spots, filling depressions and working excess water over the side forms. The edges at joints and sides are then rounded with an edger or groover. Float marks may be removed by brushing the surface with a soft-bristled brush dipped in water. If a finish made with a steel trowel is desired, the smoothness may be reduced by brushing lightly with a wire broom after the concrete has begun to harden.

Curing

Immediately after it is finished, the surface of the walk should be protected from the sun with a covering of canvas or burlap or, after it has hardened sufficiently, with sand or similar material. The covering, whatever it is, should be kept wet by sprinkling for at least 7 days.

Concrete builders using the foregoing information on the construction of concrete sidewalks will be able to produce quality work in the most economical manner.

Brothers Kibbe Have Well Organized Contracting Concern

Carrying on a business founded some thirty odd years ago, five sons of the founder of C. P. Kibbe Company, Inc., are well known in the contracting field in Springfield, Massachusetts. When C. P. Kibbe first started doing concrete work the business was confined principally to building foundations. Other concrete work, including streets, walks, alleys and drives, was soon added, however, and today the five sons of the founder are engaged in these fields.

Donald Kibbe, who handles the sales work, spends practically all of his time developing new business. In telling how he lands contracts for concrete work, Donald Kibbe made the following statement:

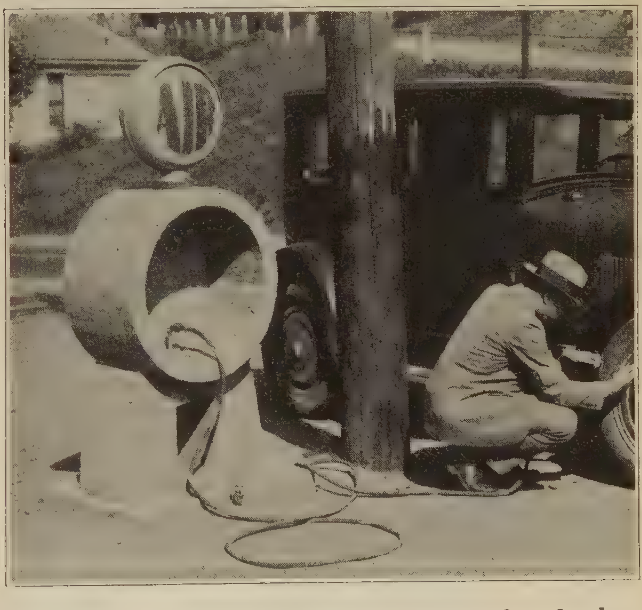
"Direct personal contact work with engineers, architects and other prospects and a long standing reputation for doing first class work have been absolutely essential to success in this type of business."

Two other sons of the founder are in charge of construction work, while the remaining two are the expert estimators for the firm. These latter two figure all jobs, submit all estimates, handle the central office and, in fact, take care of all general business details including the payroll and purchases of equipment needed to facilitate the work of the two brothers who are out on the jobs.

The C. P. Kibbe Company, Inc., is, indeed, a well balanced organization doing considerable business in the concrete contracting field each year. Good organization, with the work being allotted to the brothers best fitted to handle certain kinds of jobs, has built up this business until the firm is well known and well liked in the community it serves.

Air Hose Standard Built of Concrete

The accompanying illustration shows the concrete air hose standard at the Kaster & Frink Service Station, Lancaster, Ohio. The foundation is somewhat similar to an engine base. The drum-shaped container for the hose resembles a section of reinforced concrete pipe.



The concrete work was done as part of the contract for concrete-paved driveways and concrete greasing pits at the service station.

How to Build
A Shuffleboard Court

CONCRETE builders are finding that profitable business can be developed by selling and building shuffleboard courts. Many of them are contacting superintendents of parks and playgrounds, managers of country clubs, and owners of estates. The builders' principal sales message is that concrete shuffleboard courts will make a valuable addition to the athletic facilities of any park, playground or other place of recreation. The courts may be readily and quickly constructed at small expense. Once they are built, like tennis courts, they are permanent and practically maintenance free.

Concrete builders who want to sell this type of concrete work can learn how to build shuffleboard courts from the following construction information:

A shuffleboard court differs but little from a well constructed concrete sidewalk. Slightly more attention must be paid to obtaining a level and smooth surface. Well drained level ground is the best site for a court. The site should be stripped of all sod down to uniformly firm ground and refilled with at least 4 in. of well tamped cinders. Where the sub-soil is firm sand, the cinder fill may not be required.

SHUFFLEBOARD, as introduced in Florida, is played on a concrete court 52 ft. long and 6 ft. wide marked with scoring diagrams. Two or four players take their positions at the ends of the court. The object is to place wooden discs 1 in. thick and 6 in. in diameter in the scoring diagram by means of a cue and at the same time to prevent the opponents from scoring. Eight discs, four red and four black, are used. A printed leaflet, giving shuffleboard rules and other information, can be obtained free from this magazine.

Placing the Concrete

The concrete should be placed in two layers. The base layer should be 4 in. thick and composed of the following proportions: 1 part of portland cement, 2 parts of clean coarse sand, and 3½ parts of crushed stone or gravel. The sand should consist of well graded particles ranging from fine grains to particles ¼ in. in size. The stone or gravel should consist of particles ranging between ¼ in. and 1 in. The concrete should be thoroughly mixed with not more than 6 gal. of water per sack of cement, and carefully placed on the cinder fill. The base course should be struck off to grade, after which the mesh reinforcement consisting of expanded metal or wire mesh weighing not less than 60 lb. per 100 sq. ft. should be put down.

The wearing or playing layer should be mixed and placed within 45 minutes after the base layer is struck off. The playing layer should be 2 in. thick and should consist of the following proportions: 1 part of portland cement, 1 part of clean sand, and 2 parts of fine crushed stone or gravel. The particles of stone or gravel should not exceed ½ in. in maximum size. This layer should be made with not more than 4½ to 5 gal. of water per sack of cement. The amount of mixing water may be reduced until the concrete is fairly stiff, requiring some tamping to settle it in place. It must be remembered that the less mixing water which can be used in the concrete and yet produce a workable compact mass, the better and more durable will be the court.

After the wearing layer is placed it should be carefully brought to grade with a straight-edge. It should then be compacted with a wood float and again tested with a straight-edge to detect high and low spots which should be eliminated. Floating should be followed by a limited amount of steel troweling which should be started after the concrete has hardened sufficiently to prevent excess fine material from working to the surface. After the concrete has further hardened until it will withstand the full weight of the finisher, it should be carefully hard troweled until the desired smooth finish is attained.

Grinding the surface with a machine shod with free rapid cutting carborundum stones will give the smoothest and most satisfactory playing finish. If grinding is resorted to, the final hard troweling should be eliminated, and the concrete allowed to harden and cure for at least four days.

Curing the Concrete

Curing is one of the most important operations in the construction of a shuffleboard court. Curing is the term applied to keeping the finished surface continually wet for a period of 10 days. Water should be applied directly to the surface as soon as the concrete is hard enough not to be marred by the process. The concrete may be kept wet by any one of the following methods. The most satisfactory process would be to build small earth dikes around the edge of the court and keeping them filled with water for the required period. Another method of curing is to cover the concrete with a 2-in. layer of clean sand, or a layer of burlap, keeping the covering constantly wet by sprinkling for the 10-day period.

Curing is most important, for if the concrete is allowed to dry too rapidly at the surface, the mixing water needed for hardening will evaporate, and cause surface checking or cracks. Premature drying will also cause the surface to dust under service. The more careful the attention paid to curing, the better and more durable will be the court.

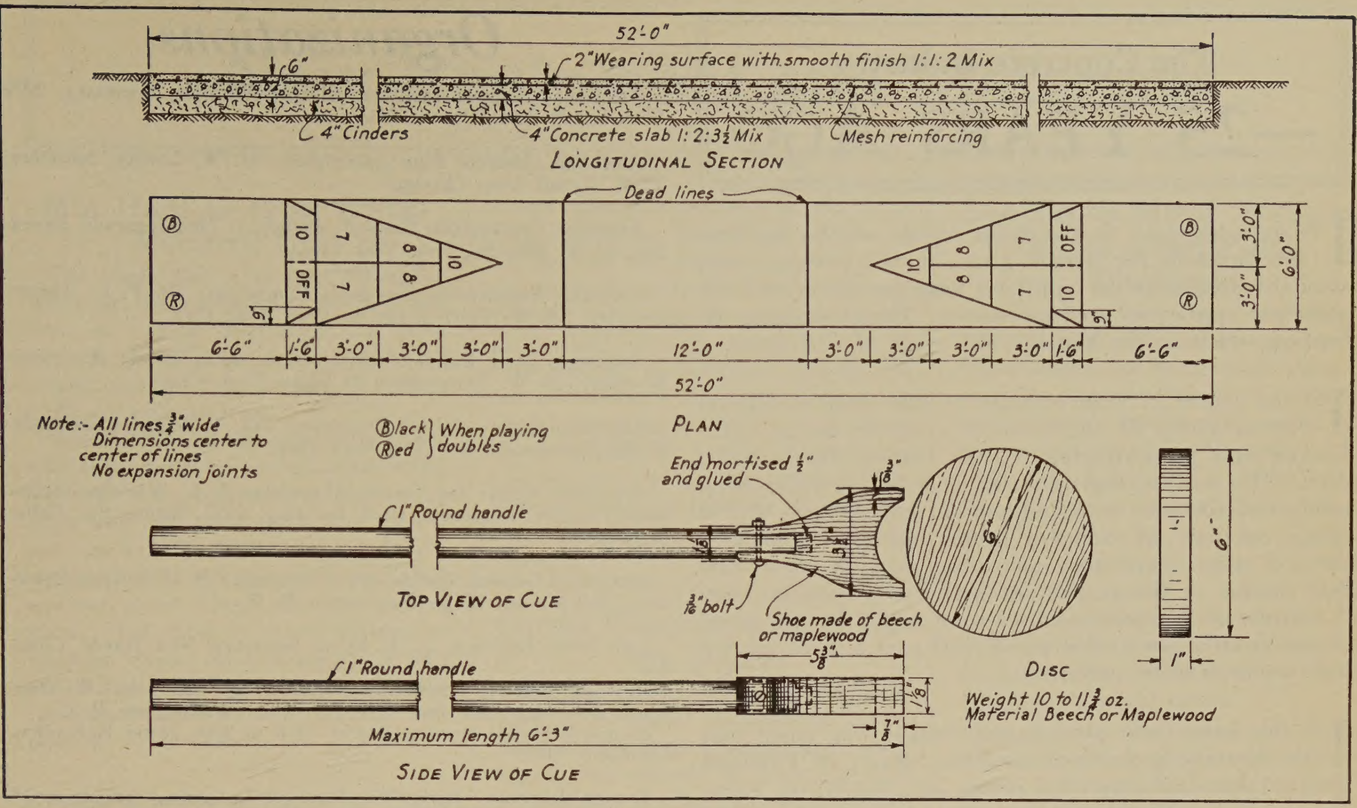
After the court has cured for the prescribed period it should be allowed to dry for 4 or 5 days, and the playing lines then painted on the surface.

Marking the Court

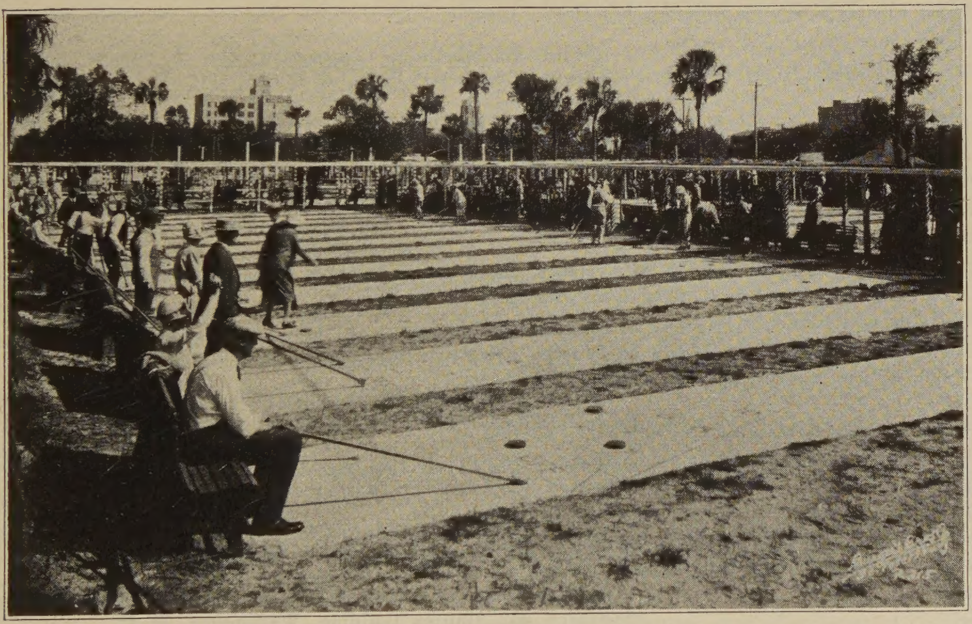
A high quality paint made with an oil or varnish base is satisfactory for use on concrete surfaces. For new construction (less than 6 months old), a zinc sulphate wash consisting of 3 lb. of crystals per gallon of water should be applied to the concrete surface to be painted. At least 48 hours should be allowed for the zinc sulphate treatment to dry after it has been applied. Any crystals that appear on the surface should be removed by brushing before painting lines.

Other Surface Treatments

If a waxed finish is desired, a treatment with paraffin



Construction details of a concrete shuffleboard court. Details of cue and disc which are used for playing this game



View of 12 shuffleboard courts in use. Over 70 of these courts have been built at St. Petersburg, Fla., and more are under way

wax dissolved in turpentine, followed by a coating of powdered wax well rubbed in, will give excellent results.

Scrubbing the surface with a strong soap solution and mopping, followed by occasional application of powdered soap after the floor is dry, is another satisfactory method.

New Jersey Concrete Builder in Business Since 1891 Active in Contracting Field

John J. Breslin, the man who laid the first concrete sidewalk in Camden, N. J., 41 years ago, is still busy at his work today. One of the first to work with portland cement when it was first introduced in this country years ago, he now heads the oldest concrete contracting business in Camden.

Although he was only a boy of 11 years when he started to work on curbs and gutters and sidewalks, Mr. Breslin became greatly interested in concrete. Today at 62, he has built up a substantial business. After working for various concerns throughout the country, Mr. Breslin started his own business in Camden in 1891. However, it was in 1888 that Mr. Breslin, then just 21, helped lay the first concrete sidewalk in Camden.

The Concrete Industry —25 YEARS AGO

IN an addendum to the main report on the uniform specifications for cement given in the previous issue, standard directions for applying tests are given and the principal appliances used are shown. These comprise the leading article in the March, 1905, issue of CONCRETE.

IN the course of what appears to have been a talk before a group of engineers on concrete design, reinforcing and proportioning, C. A. Turner, Minneapolis, said, "The mistake that is made by many in fabricating reinforced concrete is to endeavor to get strength with a cheap concrete. A common proportion is 1 cement, 3 sand, 5 stone—a mixture much too poor to secure the best results, or the greatest strength for a medium cost. A mixture of 1 cement to 2 of sand and 2 broken stone of size from a pea to that which will pass a three-quarter inch screen is to be preferred."

IN the same issue also, announcement was made that the German government and the Society of Portland Cement Manufacturers offer prizes for competitive scientific essays on the chemical processes which take place during the hardening of cements, and details are given.

IOWA Cement Users held their convention at Ames, Iowa, in March, 1904, and the meeting was reported as successful in every way. "There were about 150 registered, though the attendance was considerably greater than this," a news report stated.

A BRIEF article on reinforced concrete chimneys describes the construction of one in which the foundation was laid for steel, but the material later changed to concrete, with satisfactory results.

The article continues, saying that there is "also under construction at Tacoma, Wash., for the Tacoma Smelting Company, a chimney which might possibly be considered one of the seven wonders of the present century. This chimney will be 306 ft., 6 in. in height including the foundation."

In this connection, it is interesting to note that the structural review for 1929, in the February, 1930, issue, includes the following paragraph:

"The tallest reinforced concrete chimney in North America was built in 1929 for the International Nickel Company at Copper Cliff, Ontario. It rises to a height of 600 ft. and is 50 ft. in diameter at the base."

CEMENT AGE in its March, 1905, issue makes announcement that it and "Engineering News" will cooperate in conducting a contest of papers telling how to manufacture concrete block and how to use them in building construction.

A 7-page article describes the construction of government coal pockets at Bradford, R. I., in which steep floors presented a problem in concrete pouring. "The reinforcement," the article stated, "had a tendency to act as a screen and separate the sand and cement from the gravel. A method was devised of making the walls from slabs 4 ft. sq. and 4 in. thick, which could be made in forms and then hook-bolted into place on the side walls."

Organizations

American Concrete Institute; Harvey Whipple, Secretary, 2970 West Grand Blvd., Detroit, Michigan.

American Concrete Pipe Association; M. W. Loving, Secretary, 33 W. Grand Ave., Chicago.

American Construction Council; Dwight L. Hoopingarner, Executive, 28 W. 44th St., New York City.

American Engineering Standards Committee; Dr. P. G. Agnew, Secretary, 29 W. Thirty-ninth St., New York City.

American Road Builders' Association; Miss E. A. Birchland, Secretary, 29 W. Thirty-ninth St., New York City.

American Society of Civil Engineers; Geo. T. Seabury, Secretary, 33 W. Thirty-ninth St., New York City.

American Society for Testing Materials; C. L. Warwick, Secretary-Treasurer, Engineers' Club Building, 1315 Spruce St., Philadelphia, Pa.

Associated General Contractors of America; D. H. Sawyer, Secretary, 1150 Munsey Bldg., Washington, D. C.

Cast Stone Institute; L. A. Falco, Secretary, New Haven, Conn.

Building Officials Conference of America; Col. John W. Oehmann, Secretary, 1253 Lawrence St., N. E., Washington, D. C.
Sixteenth annual meeting, March 24th to 28th, Hotel Hollenden, Cleveland, Ohio.

Cement Institute; Luther G. McConnell, General Manager, 11 East 44th St., New York City.

Concrete Reinforcing Steel Institute; M. A. Beeman, Secretary, Tribune Tower, Chicago.
Sixth annual meeting, March 31st to April 2nd, Bon-Air Vanderbilt Hotel, Augusta, Ga.

Haydite Manufacturers' Association; Dan F. Servey, Secretary-Treasurer, 203 Mutual Building, Kansas City, Mo.

Iowa Concrete Products Association; R. L. Gavin, Secretary-Treasurer, 1002 Hubbell Bldg., Des Moines, Iowa.
Annual meeting, February 19th and 20th, Des Moines.

National Association of Builders' Exchanges; Earl F. Stokes, Secretary, 15 E. Fayette St., Baltimore, Md.

National Concrete Burial Vault Association; J. H. Stuart, Secretary-Treasurer, Bremen, Ohio.

National Concrete Products Association; Jack Franklin, Secretary, 425 East Water Street, Milwaukee, Wis.

National Crushed Stone Association; J. R. Boyd, Secretary, 751 Earle Building, Washington, D. C.

National Fire Protection Association; Franklin H. Wentworth, Secretary, 40 Central St., Boston, Mass.

National Lime Association; Norman G. Hough, Secretary and Manager, 927 Fifteenth St., N.W., Washington, D. C.

National Sand and Gravel Association; V. P. Ahearn, Executive Secretary, 432 Munsey Building, Washington, D. C.

National Slag Association; H. J. Love, Secretary-Treasurer, 937 Leader Building, Cleveland, Ohio.

Northwest Concrete Products Association; W. P. Hews, Secretary-Treasurer, Yakima, Wash.

Ohio Concrete Products Association; G. M. Friel, Secretary-Treasurer, 2284 North High St., Columbus, Ohio.

Portland Cement Association; William M. Kinney, General Manager, 33 W. Grand Ave., Chicago.

Rail Steel Bar Association; H. P. Bigler, Engineering Secretary, Builders' Building, 228 N. La Salle St., Chicago, Ill.

Wisconsin Concrete Products Association; Jack Franklin, Secretary-Treasurer, 3115 Plankinton Arcade, Milwaukee, Wisconsin.

New Equipment and Materials

Mix Haul Is New Truck-Mounted Unit

The Chain Belt Company, Milwaukee, Wisconsin, has announced the Rex Mix Haul as a new development in truck-mounted mixers. It is designed to be extremely portable, light in weight, and built to fit any make of truck.

Mounted low on the supporting frame, with large charging opening, variable flow discharge chute, independent, easy turning drum with three-point anti-friction suspension, the Rex Mix Haul is an entirely self-contained unit, with its own power plant and own power take-off, the manufacturer states. The drum is driven by genuine Chabelco Chain, the transmission is fully enclosed and operates in a bath of oil, and the water is the same system that is supplied on all Rex mixers.

Complete New Line of Concrete Products Machinery

C. B. Dutton, president, and S. H. Wightman, vice-president of the Portland Concrete Machines Company, Chicago, announce a complete new line of concrete products machinery. This company has entered into a manufacturing association with the Industrial Brownhoist Corporation of Cleveland, Elyria and Bay City, thereby putting manufacturing resources and facilities of the highest order behind the Portland line of equipment.

Among the characteristics claimed for this new line of equipment is the full automatic operation. Hand levers and foot pedals have been completely eliminated, leaving only the clutch lever to operate. Automatic feeding of pallets is accomplished through the use of a pallet magazine stacker or rack.

Cast iron castings have been eliminated from this line of equipment. Small machine molds are made of a rugged one-piece casting, and stripper molds are solid one-piece castings made of electric furnace steel.

Paraffine Is Recommended for Waterproofing

A six-page folder prepared by the Kalamazoo Paraffine Company, Kalamazoo, Mich., suggests the use of paraffine as waterproofing for both monolithic and precast concrete. Application to the latter is described as follows: Where possible the concrete product is immersed on the exposed side only, to a depth of one inch, in a bath of hot melted paraffine at a temperature of 200 deg. F. The heat present at this operation drives the wax, due to its high penetration, beneath the surface of the concrete and deposits it there. After approximately thirty seconds the article is removed and the paraffine hardens as soon as the heat passes off.

In applying to monolithic concrete, the hot melted wax is sprayed or brushed. A blow torch or similar flame is then played on the surface to provide the necessary heat for driving it into the structure. After a longer period of time the paraffine diffuses thoroughly throughout the porous structure.

Curing Concrete with Building Paper

Building paper known by the trade name of "Sisalkraft" is advocated by the Sisalkraft Company, Chicago, as a covering on fresh concrete, in floors and walls in particular, for the purpose of preventing evaporation of the mixing water in the concrete.

On floors the paper is unrolled in long parallel strips, each strip overlapping the adjoining strip from three to six inches. Boards or green core tape is used to hold down the overlapping edges and prevent the entry and circulation of air.

New Unit Has Six Cylinder Power Plant; for Heavy Duty High Speed Service

The latest addition to the line of Mack trucks is a new 6 cyl. truck designed for those fields where diversified hauling requirements demand power, capacity and high, safe speed.

According to its makers, the new Model BC does not supplant any existing Mack model, but is instead a modern addition to the line.

With a bore and stroke of 3¾ by 5½ in. the BC engine develops 100 horsepower at 2400 r.p.m.

Ignition is by battery and distributor with semi-automatic advance. The electrical system is of the 12 volt type and of North-East make.

The clutch on the new model is of the Mack single plate, dry type, with the clutch housing and transmission bolted to the crankcase to form a unit power plant. The transmission is a four speed unit with direct-drive on fourth. All spring tips, the radiator, steering column and cab are rubber shock insulated.

Final drive is by Mack dual reduction with inclined rear axle of banjo type.

Lee Truck Mixer Features Rapid Charge and Discharge

Filling of the drum in a few seconds with a correct and uniform mix, under central control, the manufacturer states, is one of the features of the Lee 1 yd. transit concrete mixer. Dumping, by gravity, it is said, requires only 8 to 10 seconds.

The unit consists of a 1 yd. drum 5 ft. long, and 3½ ft. wide. There is a door 2 by 2 ft. for charging and discharging, a dog snap latch, finger blades, two 12 lb. rail supports running in flanged wheels, sheet metal guards, chute and fenders. At a truck speed of twenty miles per hour the drum rotates four or five times per minute, with no strain on the motors.

The unit may also be used as a stationary mixer with a minimum consumption of power. It is the product of the Lee Transit Mixer Company, Indianapolis, Indiana.

Chain Belt Announces Champion Paver for 1930

The Chain Belt Company has announced the new Champion paver for 1930—the Rex 27-E. Built from an entirely new angle the Rex Champion is designed to take care of present and future specifications which call for dryer, quicker setting concrete. The New Champion's drum with new blades and buckets provides greater leverage for moving dry, heavy and sticky concrete quickly and easily, according to the manufacturer.

The Rex Mechanical Man, fully automatic control, in which the cycle can be speeded or slowed, is operated by a one-step foot control for 1930. The New Champion skip, wide enough for dual pneumatics, rises to a perfect angle of 52 degrees in 8 seconds when the automatic anticipating governor opens the engine wide, the manufacturer states.

The New Champion bucket with a straight line drop levels the entire batch into a broad, flat ribbon of concrete and the power boom swing swings the boom wherever the operator wants it by the moving of a single lever. A lower, stronger top frame and an over-strength chassis are other features.

Multiple disc clutches, enclosed transmission running in oil, bigger Rex chain drives, genuine Timken roller bearings, new, larger, Waukesha motor, and larger crawler treads make the New Champion one of the outstanding Rex pavers.

About Makers of Equipment and Materials

INDUSTRIAL LITERATURE

Ornamental Mold Catalog

"Molds, Architectural and Ornamental" is a 20-page catalog covering a wide scope of molds for ornamental units, including bird bath fonts, pedestals, lawn benches, flower boxes and pots, balusters, and posts, as well as chimneys.

The Ideal division of the *Consolidated Concrete Machinery Corporation,* Adrian, Michigan, is distributing the catalog.

Concrete Transport Bodies

A 27-page sales manual prepared by the *C. O. Bartlett & Snow Company,* Cleveland, Ohio, describes its concrete transport bodies.

The following are a few of the chapter headings: Background of movement which has brought about central mixing plants, stages of development—old method, and new method—prospects, the central mixing plant versus the old method, the central mixing plant system versus the transit mixing plant system, Bartlett & Snow bodies versus other types of bodies.

Silicate of Soda Curing

A 26-page booklet published by the *Grasselli Chemical Company,* Cleveland, Ohio, tells about the curing of concrete with silicate of soda.

Application, equipment needed, specifications for curing, use of hydrometer, and the advantages of such curing are some of the subjects covered.

Pottsco Circular

A 4-page folder prepared by the *H. H. Potts Company,* Chicago, Ill., for manufacturers of *Pottsco* light-weight back-up units brings out briefly its various qualities, emphasizing the insulating value, and includes laboratory findings, a simple test, and an enlarged illustration of the aggregate.

On Commercial Pallets

The 1930 edition of the pamphlet descriptive of *"Commercial Pallets for the Concrete Products Industry"* is now being distributed by the *Commercial Shearing and Stamping Company,* Youngstown, Ohio. As in previous issues, the pallets are thoroughly described and pictured.

Crane Booklet

An attractive and unusual presentation of crane and derrick units is made in a booklet just published by the *American Hoist and Derrick Company,* St. Paul, Minnesota.

Entitled *"Quality Engineering,"* it shows machines especially adapted to the contracting and road building fields.

Mix Haul Broadside

A broadside issued by the *Chain Belt Company,* Milwaukee, Wis., illustrates plainly its new Mix Haul, a new truck-mounted unit.

"Concrete Special" Curing

A 16-page bulletin devoted to the subject of curing concrete roads with silicate of soda and entitled *"Curing Concrete with Concrete Special,"* has just been issued by the *Philadelphia Quartz Company,* Philadelphia, Pa.

NOTES FROM THE FIELD

DuPre Joins Distributor

Wallace W. DuPré, for fourteen years sales manager of the *Knickerbocker Company,* Jackson, Michigan, has purchased a substantial interest in the business of *Thomas Brown,* Inc., Baltimore, Md., and Washington, D. C., distributors of Knickerbocker concrete, mortar and plaster mixers and saw rigs, Keystone power shovels and Marlow pumps, and will make his headquarters in Baltimore. He retains his interest in the Knickerbocker Company, remains its vice-president and will give his general attention to the company's eastern sales.

Pease Executive

W. Earle Pashley, advertising manager of the *C. F. Pease Company,* Chicago, Ill., has been appointed assistant sales manager and second vice-president. Simultaneous with that appointment Mr. Pashley was elected to the board of directors and in addition to his new responsibilities will continue in charge of advertising and all promotional activities of the company.

DeVilbiss Expands

Increasing volume of business in southern California territory is the reason for the establishment of a new sales and service branch by the *DeVilbiss Company* at 2305 East 8th Street, Los Angeles, Calif. *R. J. Burns* is manager of the new Los Angeles branch.

Ryerson Completes Detroit Expansion

A new heated building with increased facilities for storing and dispatching at Detroit, Mich., has been completed recently by *Joseph T. Ryerson & Son, Inc.,* at 1600 East Euclid Avenue.

Plans for increased stocks are well under way, the most recent additions including over five hundred sizes of cold rolled steel, reinforcing bars and other allied products. Special grades and sizes of these stocks are being carried to meet individual requirements of various industries. New lines of metal working machinery and small tools have also enlarged the scope of the Ryerson machinery sales.

Facilities are available for customers who wish to call for material, an entire span in the new unit being devoted to this service.

Sirrine Autocar Engineer

H. M. Coale, vice-president in charge of sales of the *Autocar Company,* has announced the appointment of *E. D. Sirrine* to the position of transportation engineer on the Autocar headquarters staff. In that capacity he will be available to make professional surveys and recommendations concerning the transportation problems of business houses whose operations are of a size to require such studies.

NEW EQUIPMENT

Ingersoll-Rand Makes New Air-Cooled Compressors

Ingersoll-Rand Company, New York City, announces a new line of air-cooled, two-stage air compressors, known as the Type 30. V-type belt drive is employed. Both motor and compressor have ball bearings.

The units are self-contained, the motor and compressor being mounted on a steel base, which is attached to the top of the air receiver. The latter, which is made of heavy pressed steel, is built to withstand a working pressure of 200 pounds. With this arrangement, no special foundation is required for correct alignment of the compressor and motor. The compressor is ready to operate as soon the electrical connections to the motor have been made and the crankcase filled with oil, the manufacturer states.

It is built in four sizes: ¾, 1½, 3 and 5 horsepower. All sizes are built for a working pressure up to 200 pounds continuous duty.